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Amateur Radio

SERVING AMATEUR RADIO SINCE 1945
MARCH 1997

CQ

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- **W1FB Builds A 60 W. 6M. Linear**
- **160 Meter "Upside–Down" Antenna**
- **New RF Safety Question To Appear on No–Code Exams**

On the cover: Allan Buckshon, VE7SZ
Langley, BC, Canada

U.S. $3

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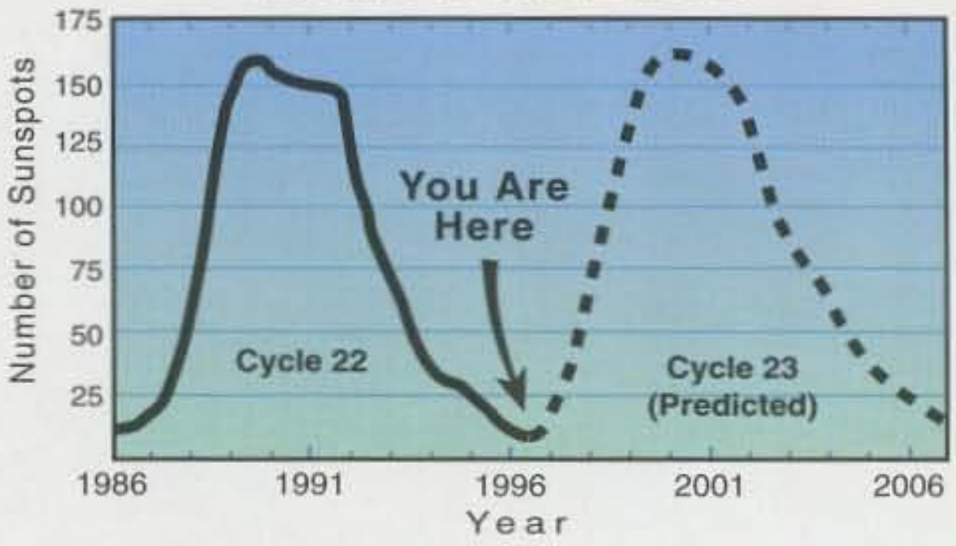
IO AMATEUR'S JOURNAL

R7000

10, 12, 15, 17, 20, 30, 40 Meters

The cold winter of low sunspots is thawing. The solar flux will soon begin it's steady climb. Cycle 23 begins Now - and Now is the time to start your station upgrades. As each month passes, DX will find it's way from 20 to 17 to 15 to 12 to 10 meters. Don't miss the action. The best operating conditions are just ahead.

SOLAR CYCLES 22 AND 23

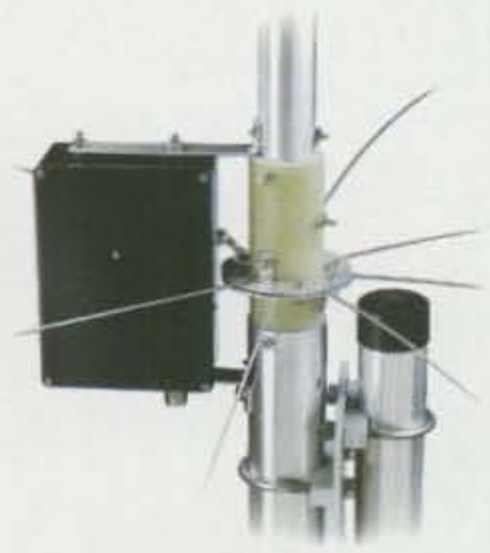


AL6063 Cover Design
The cover completes the LC circuit of the trap. The beauty is in the simplicity; these elegant trap covers make stable capacitance and higher power handling possible.

Controlled Inductance Traps
Cushcraft holds the trap inductance within close tolerance so there's less tuning and outstanding in-weather performance.

All Materials
are either stainless steel, aluminum, or high impact plastic.

Double Wall Tubing
makes up the lower three sections. This 0.116 inches of wall insures top performance in winds up to 80 mph.



Mounting Hardware
is extra rugged and makes installation easy on any 1-3/4" to 2-1/8" OD mast.

• EXPANDABLE TO 80M
Transform your R7000 into a R7000+ by adding 80 meters with the R80 kit (trap, tubing, guy & ground wire)

• RELIABLE
New trap design is stable in all conditions

• EASY INSTALLATION
For typical use, tuning is not needed after installation

• AUTO BAND CHANGING
To any band from 10 through 40m (80m with R80 kit)

• SLIM SILHOUETTE
Gain favor of family and neighbors with the slim, smooth profile of our new trap design.

Be ready for the coming sunspot cycle!

SPECIFICATIONS
FREQUENCY
10, 12, 15, 17, 20, 30, 40 M
(80 M with optional add-on)
HEIGHT
R7000 - 24 feet (7.3 M)
R7000+ - 32 feet (9.8 M)

"I bought the R7000 specifically for our Barren Islands IOTA trip. It worked FANTASTIC. I think it is one of, if not the, best built antennas I've ever seen. We experienced 75 mph winds on the island and we kind of expected the antenna to buckle in the wind . . . it didn't. Amazing!" N6IV/KL7

"What a fantastic DXpedition antenna. Tnx for a quality product." NL7TB

If you'd like to know more about the R7000 and R7000+, check it out at http://www.cushcraft.com. We'll even show you what's inside the black box and tell you how it works. Or get an R7000 brochure from your dealer anywhere in the world, hamsales@cushcraft.com, or by contacting our ham sales department.

AVAILABLE THROUGH DEALERS WORLDWIDE

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ALINCO DX-70

The "Take Me Along" HF + 6M Radio

DX-70T and DX-70TH

- 100 memories
- Detachable faceplate
- SSB, CW, AM, FM and Digital modes
- Speech Processor, standard
- Narrow Filter, standard
- Auto Power Off
- Selectable RF Gain and AGC
- Scan Modes
- CTCSS encode for 10M and 6M FM repeaters
- Wide range general coverage receiver
- Separate antenna terminals for HF and 6M
- DX-70T MSRP under $1,000

EDX-2 Auto Antenna Tuner

- Tunes 160-10 Meters (40 foot wire antenna required for 160M, 8.8 foot minimum for others)
- Fully integrated with Alinco DX-70 radios
- Weather resistant housing, can be mounted outdoors
- Comes with 16 feet of coax and control cable (cables may be extended)
- Maximum input: 200 watts
- Perfect for mobile, marine, home or portable use
- MSRP under $350

Whether you work the DX or you *are* the DX, Alinco's DX-70 is all you need, and it's ready to go at a price so low, it's hard to believe!

Perfect for use on the road, on the water, at Field Day, or at home in the shack, the DX-70 is a rugged player with great credentials. Choose the DX-70T (100 watts HF, 10 watts 6M) or the new DX-70TH (100 Watts on HF and 6M). Either way, you're on the air with a radio that's a solid performer. Plenty of "extras" are included like Alinco's exclusive multi-function control that makes operation easy, full QSK, semi or automatic CW operation, standard speech processor, narrow filter, detachable face, 100 memories, quick offset, CTCSS encoder and more.

Add Alinco's new EDX-2 Automatic Antenna Tuner and you're ready to work the HF bands with the push of a button. Before you purchase ANY HF mobile or portable radio, check out the DX-70 and the EDX-2 from Alinco.

Simple ▪ Clean ▪ Dependable

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Specifications are subject to change without notice or obligation. Performance specifications only apply to amateur bands. Permits required for MARS/CAP use. Prices mentioned are MSRP. Dealer prices may vary.

CIRCLE 166 ON READER SERVICE CARD

CQ Amateur Radio

MARCH 1997 VOL. 53, NO. 3

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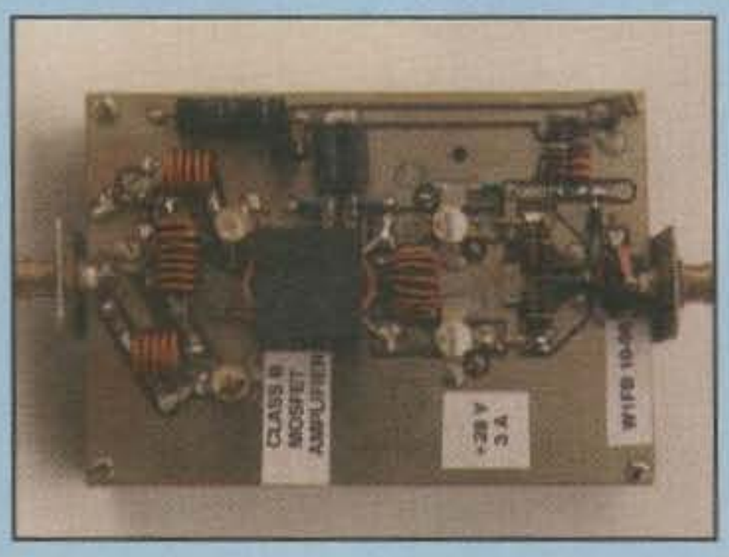

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112 HAM SHOP

ON THE COVER: Out in the wide-open spaces of British Columbia we find Allan Buckshon, VE7SZ, at work on one of his numerous Yagis. In real life Allan is a pharmacist; in his Amateur Radio life he's an active DXer and contester. The antenna farm consists of three towers: 100 ft. (5/5 on 10 and 15), 120 ft. (5/5 on 20, 4-el. M^2 on 40), and 150 ft. (2-el. M^2 on 80 and a delta loop on 160). Licensed since the age of 15, Allan took World High for 80 meters in the 1996 CQ WPX SSB Contest, and at press time was only one or two away from having worked them all for DXCC.

(Photo by Larry Mulvehill, WB2ZPI)

Say You Saw It In CQ

NEW! HF + 6M Version

World's First HF Rig with CW Auto Tune and DSP Built-in

Kenwood makes Digital Signal Processing technology available to everyone with the all-new TS-570D and TS-570S. Imagine a DSP radio that you can operate in the shack, the car, or on a remote DX island. These are the first DSP rigs that meet the needs of today's HF operator within a budget. From the first moment that you hear the incredibly clear and powerful audio and operate the new, common-sense ergonomic design, you will realize the TS-570D or TS-570S is the HF rig built for you.

The TS-570D and TS-570S offer the world's first CW AUTO TUNE feature which enables automatic zero-beating for CW operation. The RCP-2 Radio Control Program also allows the HF operator to design and program multiple radios with custom settings while conveniently saving them to a PC file for future use. Advanced Kenwood design and features coupled with traditional Kenwood HF performance make the TS-570D/570S a masterpiece that you can proudly operate. If you have been waiting for a new DSP HF radio with performance at an affordable price, wait no more.

Large LCD display features a 4-stage dimmer while the **7-digit alphanumeric sub-display** provides menu mode guidance, split frequency display and digital filter selection options. Easy-to-read **S/PWR/COMP/SWR/ALC** meters and an operating guidance feature help to greatly simplify operation.

16-bit DSP technology delivers superb audio quality on both transmit and receive. **Noise reduction** (line enhancer method and SPAC), **audio equalization** (voice/transmit equalizer and speech processor), **slope tuning** and **automatic IF filter bandwidth selections** can be operated with a touch of a button.

Power output can be set between 5 ~ 100 watts in 5 watt increments. 5 watt setting is ideal for QRP operation.

Preset auto antenna tuner with 18 sub-bands from 1.8 MHz - 30 MHz and memory for both antenna ports.

10-key direct frequency entry

Preset auto antenna tuner

World's first CW Auto Tune enables automatic zero-beating for CW operation.

Quick memory provides five channels for on-the-fly frequency control: **M.IN** stores data, **MR** recalls it.

Electronic keyer provides speed settings of between 0 and 100 wpm and dual key inputs on the back – one for the paddle and one for the key.

Menu system offers 46 types of functions to assist novice thru extra class operators.

A wealth of scanning capabilities enhance operability. Scan speed is variable and can be set for time-based or carrier-based resume. Scanning can work across channels, groups of 10 channels, all except locked out channels, or it can be programmed to scan a frequency range between two channels.

• Mobile/fixed station size (10-5/8 x 3-3/4 x 10-11/16 in) • Heavy-duty design • CW message memories
• CW reverse mode • Full break-in and semi break-in • High-speed 57600 bps PC control • Dedicated packet port

TS-570D / TS-570S

HF Transceiver **HF + 6M Transceiver**

"New"

On 6M too!
- √ **DSP**
- √ **100 Watts**
- √ **Preset Auto Antenna Tuner**

With a half century of engineering and design experience to draw upon, Kenwood is changing the future of HF communications technology. High quality TX-RX audio reproduction with extremely effective DSP interference reduction delivers pleasing performance to your ear and over the air. You will also enjoy the large, easy-to-read LCD display with a built-in on-screen operator guidance system for simple operation. Features like 10-key direct frequency entry with new "soft-touch" keys, auto-antenna tuner, 100 to 5 watt for QRP operation, variable scanning speed, built-in CW keyer, ANT 1-ANT 2 ports, IF shift control, RS-232C com-port, 100 memory channels, CW reverse, optional VS-3 voice synthesizer and DRU-3A digital recording unit make the TS-570D or TS-570S the radio for you.

ISO 9002
Meets ISO Manufacturing Quality System

RCP-2 software allows you to build different radios on screen and save all your functions and settings to a file for future use.

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ZERO BIAS

AN EDITORIAL

It's like horses at the gate. The race is about to start and everyone is apprehensive. The players and the watchers, the doers and the dreamers all are waiting for the sunspot Cycle 23 roll to really take off. George Jacobs, W3ASK, assures us that we should see the race start in earnest sometime this year. Check his "Propagation" column this month for the latest details. By the way, this month marks George's 47th year as Propagation Editor, in a sense making him Dean of the *CQ* staff. Congratulations, George. We all appreciate your dedication, effort, and expertise throughout the many years and many cycles.

For most of us in the industry Cycle 23 can't come soon enough. The last few years have seen a diminution in the number of distributors and manufacturers, coupled with rising costs for those remaining. This unhealthy and vicarious state characteristically and traditionally improves as the new cycle advances. In essence, therefore, for our various reasons we all are waiting for the glorious return of HF, DXpeditions, and the splendiferous concept of "DX Is." Whatever the hobby is, it revolves around HF and HF's vagaries.

From my perspective—number of years licensed, age, and number of years actively employed in the industry—I'm witnessing four cycles, or shortly will have four cycles under my belt. They've all revolved around HF and HF operation. That's just the way it is. With that in mind, and with that experiential set, two things recently gave me pause to question the logic of where we all are going, why, and whether or not the drum to which we're marching has a fatal flaw.

The first thing happened during the Christmas holiday season when I was home on vacation. I received a telephone call from someone doing an interview for an amateur radio publication. Initially the questions were focused to gauge my reactions to the ARRL WRC-99 Opinion Survey. I don't generally comment in print on what the ARRL does, how they do it, or the correctness of their actions. I have done it several times over my tenure as Editor, but I guess that was more of a visceral reaction and impulsive response as a Life Member.

The interviewer wanted my opinion of the CW requirements and as such I told him. Basically, it's not what I want or don't want, but it is a perception or appreciation of which way the wind is blowing and how things will be progressing in the next several years. He gave me some basic statistics on the poll which were not surprising nor in a sense binding on anyone. On an issue this large in our emotional bank, the sample was small, too small in my opinion. If this was important to the ARRL and to amateur radio for the future, then every single member should have received the poll package put out by Readex Inc. Physically, that's who the League represents, which amounts to about 22 or 23 percent of the total number of licensed amateurs. None of us in this industry or as individuals can really say with any certainty what the majority of us are like, what we think, or what we do, if anything. So we play games with statistics and extrapolate and massage data to whatever level of confidence and certainty that makes us happy. That doesn't make the results false or even true. It just makes them specious at some level of comfort. If the ARRL is happy with their results, I'm also happy.

The second thing that occurred was the publication of the results of the survey in the February issue of *QST*. I read the results several times, and with a monumental leap of faith I said okay, the 1176 people have spoken for the membership and perhaps amateur radio as a whole. We all love CW and we all use it all the time—at least the 1176 do. So sayeth someone.

The grains of sand that irritated my craw (wherever that is) took a bit of time to discern. To me, the gross error in logic, and the thing that simply annihilates everything after the major premise, is the demographic results, figs. 2 through 5. Even a first-year philosophy student knows that things have to agree with each other to have some tangible validity. Fig. 4, a bar graph showing the demographic response to the 1176 people who without reservation champion the retention of CW requirements, depicts the respondents' personal use of CW. Well, 72 percent of these people either rarely or never use it at all. This also includes one percent of the 1176 who didn't think the question important enough to answer. Maybe we're not talking about love anymore, but a somewhat strong physical attraction. Fig. 5 then goes on to depict these same respondents' personal use of the amateur radio frequencies. There, too, a sizable number are VHF/UHF operators with some HF activity. Now this doesn't make any of these people bad nor the ARRL Machiavellian. It just means that the approach, the means, and the interpretation are seriously flawed and something I wouldn't want to bet my life on or invest money in. Maybe you would.

If this is the genesis of where we are to go in the next century, then we're all in trouble. If you don't see it, that's okay; you're sure to feel it somewhere down the line. CW is not really the issue nor is it a preoccupation with how many vanity callsigns one can amass. None of these go to the core of where we are and where we're going. Even if all of us, every single one of us, wanted to retain CW as a requirement in its present or even a modified form, and the FCC for whatever reason decided to drop it as a requirement, it would cease as of that moment. Our own government is "right-sizing" its own use of CW for our military and affiliates and could come to the decision that the expense and concern for CW as a requirement for amateur radio is an anachronism and therefore gone. The operant word that most of us never hear or pay credence to is *requirement*. CW as an operating mode will probably be around for a very long time.

Be that as it may or may not, the issue I have trouble with is a flawed survey with specious results extrapolated out to the nth degree of silliness. Do I or do you then by virtue of the mystical powers of the ARRL and Readex Inc. say with acceptance and certainty "so say we all"? Does this somehow transcend into law or total affirmation? I somehow don't think it does or should. CW is not dead nor is it apparently dying. It's simply a mode that people like to use. The one simplistic statistic that tells the whole story is the number of respondents who regularly or always use CW—27 percent. If we would like to maximize or qualify the meaning of 1176 people who took the time and effort to respond, let us simply reflect their usage as the response. Roughly three quarters of the total rarely or never use CW, and about 25 percent use it all the time. If it is so important to these people as a requirement, then something else which is arbitrary and capricious is operating here. The argument then has nothing to do with providing validity to the requirement if the proponents see little or no value in using CW. The case *for* becomes ethereal or philosophical with a strong dose of history thrown in. There are plenty of good and rational reasons for using CW. It's just that three quarters of the people think it's good for someone else and not them. As my mother used to say, "If three quarters of the people jump off the roof, does that mean you have to also?"

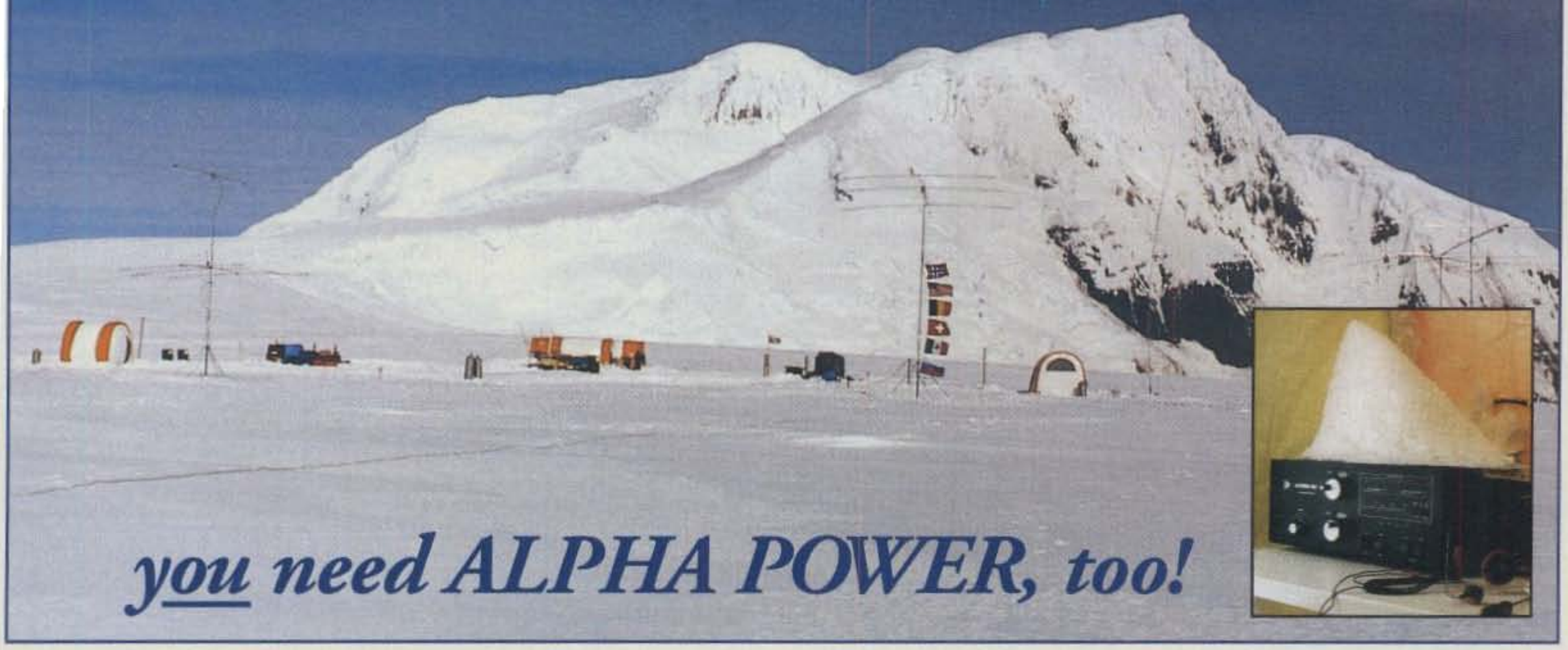
The latest DXpedition to Heard Island is once again providing the bands, such as they are, with scores of policemen and the usual garbage. We're fortunate not to be at a sunspot high right now, as the cast of characters would be much larger. I expect the usual letters and gripes about limitations, award rules changing, and dire restrictions. Somehow we never get around to requiring that anyone be able to learn and demonstrate a knowledge of operating skills in order to get a license. There are more than enough examples of from poor to malevolent and hateful operating out there to suggest that some changes in that area should be required. On the other hand, if some of those egocentric hate nets strictly operated our beloved CW, at least three quarters of us would never know or be bothered.

I guess as we expect some things to get better in the new cycle, we might give a scrimpet of thought to not only the next ten years, but where the hobby is going now and how individually we can help make it better. Technology has changed much faster than a lot of us can assimilate. We've come nowhere close to touching what is available now, let alone a few years hence. Things have to change and adapt with different priorities as to importance. Otherwise, ten years down the road if there is such a thing as a DXpedition, everyone there will be a policeman. Whom else are they going to learn from?

73, Alan, K2EEK

Say You Saw It In CQ

When you absolutely, positively have to get him logged tonight...



you need ALPHA POWER, too!

January 1994: 3YØPI, Peter I Island, Antarctica – The most elaborate and expensive DXpedition in history lands by helicopter from a Russian icebreaker. For three weeks, the team depends on its radios and ***ALPHA 89*** amplifiers for success and survival. Expedition leaders sum it up: *"The **ALPHA** amplifiers performed flawlessly."* – Ralph Fedor KØIR. *("Even under 30 cm of snow!")* – Peter Casier, ON6TT. *"All the **ALPHAs** worked the first time we powered them up and were still working 61,000 QSOs later. I was amazed at the reports we received under very difficult band conditions."* – Tony Deprato, WA4JQS.

September 1995: XRØY, Easter Island – Professional explorer KK6EK gathers a large team of divers and amateur radio operators on this enigmatic Pacific island. The hams provide communications and evaluate state-of-the-art technologies for use by 21st century DXpeditions. Powered by five ***ALPHA 91B*** amplifiers, XRØY dispenses tens of thousands of QSOs on 160-10 meters.

January 1997: VKØIR, Heard Island, South Indian Ocean

Twenty men land with 10 tons of gear on another inhospitable island at the edge of the world. It has cost $200,000 *just for transportation* to this most-wanted DX country. "Short path" to Tokyo is 7500 miles, to London 8500 miles, to Seattle 12,000 miles. Propagation is always tough here; with sunspots near minimum, the high power amplifiers will be crucial to the group's safety and the expedition's success. Organizers KK6EK, KØIR and ON6TT naturally rely on the same ***ALPHA/POWER 91B***s that proved themselves at XRØY.

World-Class DXpeditions to remote and dangerous places choose ***ALPHA/POWER*** amps for their power, durability, and ease of use. Team members frequently bond with "on-loan" ***ALPHA***s to the point of buying them after the trip!

Of course almost everyone's dream amplifier is the *ALPHA 87A.*

"The Ultimate Linear" is the pileup-blaster used by serious DXers and contesters from AI6V to ZD8Z – because it absolutely outperforms everything else! *"The **ALPHA 87A** effortlessly delivers maximum legal-limit power from 160 through 10 meters...it automatically tunes itself for operation on a new band in about a second...delivers on all of its promises."* **QST** Product Review, June 1992

Winners insist on the performance and dependability of *ALPHA POWER.*
Why would *you* buy an amplifier from anyone else?

Call Dave AAØRS or Brad KØHM for technical details and delivery information.

ALPHA/POWER , Inc.
14440 MEAD COURT * LONGMONT, CO 80504
(970) 535-4173 * FAX (970) 535-0281

ANNOUNCEMENTS

• **The Annual St. Louis County SKYWARN** Severe Weather Observation Training Seminars have been scheduled for Saturday March 15, March 22, April 5, and April 12. Level 1 training is presented in the morning and classes resume in the afternoon with the SKYWARN Level 2 program. For locations, call the Severe Weather Information Line at 314-889-2857 for a taped message and more information.

• **Free VHF/UHF and HF FCC Radio Classes** starting January 14, 1997. Classes will be held at the Red Cross Building, Hickory Street, Melbourne, Florida and are sponsored by Platinum Coast ARS. For further information, call John at 407-773-8314 or Harry at 407-952-9921.

• **CLARA '97 Gala Celebration**, September 26–28. Visit the Fred Hammond Radio Museum, enjoy buffet style meals, dinner theater, Saturday lunch meeting and forums, Saturday night dinner/dance and Bon Voyage Breakfast on Sunday morning. For further information and advance reservations, contact Cathy Hrischenko, VE3GJH, 13451 Concession 1, RR 1 Zephyr, Ontario L0E 1T0 Canada.

• **Snow Train Ham Expedition**—The Algoma ARC and Algoma Central Railway, Inc. announce the first Snow Train Ham Expedition. This expedition will be a scenic and adventurous journey which will include amateur radio operation to and from the Agawa Canyon on March 16th. All stations worked will receive a special QSL card with the call VA3ACR to commemorate the event. Frequencies of operation will be CW 3545, 7045, 14050, 21050; SSB 3760, 7260, 14260, 21260. Drop them a line via packet radio station VA3ASC to advise them of your intentions. For more information and reservations, call 1-800-242-9287.

• **The Pilgrim Amateur Wireless Association** is celebrating its 20th anniversary and is sponsoring an award for stations that work club members. A commemorative certificate is available to all stations who work five club members between March 1 and May 31, 1997. Club members will sign /20 after their callsigns to identify themselves on the air. A certificate will be awarded for phone and CW. All CW contacts must be in CW only portion of the bands. Look for them in the bottom 50 kHz on 10–80 in the General portion. To receive a certificate, send list of contacts with standard QSO information and 9 × 12 SASE with 2 units of first-class postage to PAWA 20th Anniversary, P.O. Box 245, Raynham, MA 02768.

•The following Special Events are scheduled for March:

W4BKM, from the 15th Annual Cherry Blossom Festival, Macon, Georgia; The Macon ARC; 1500–2300Z March 15; operation on phone 7.235, 14.240 and 21.335; and on CW 7.135, 14.035, and 21.135. For certificate, send QSL and 9 × 12 SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208.

W4UG and **LA5M**, from the 106th anniversary of the *Norwegian Lady*; the Virginia Beach ARC and Moss ARC; 1300Z March 22 to 2000Z March 23; operation on 3.878, 7.278, 14.278, 21.278, 28.363, 7.040, 10.120, 14.040, 146.040, 146.550, and 10 kHz up from the bottom of the Novice subbands. For certificate, send QSL and SASE to VBARC, P.O. Box 62003, Virginia Beach, VA 23466.

• The following hamfests, etc., are slated for March:

March 1, **SPARC Springfest '97**, Holy Spirit High School, Absecon, New Jersey. Contact John Barbieri, KB2HZU, 609-653-1987, or SPARC, P.O. Box 142, Absecon, NJ 08201.

March 1, **The N.E. GA "Bubba" Net Hamfest**, Madison County Fairgrounds, Comer, Georgia. Contact James Daniel, AE4HS, 152 Windfall Drive, Winterville, GA 30683 (706-742-2777). (Exams.)

March 1, **The Annual North Jersey Hamfest**, PAL Building, Parsippany, New Jersey. For information or reservations, call Bernie, WB2YOK, at 201-584-5399 (fax/voice 24-hours); or on-line at <75503,3221@ compuserve.com>.

March 1, **Ocoee ARS Hamfest**, George R. Stuart School, Cleveland, Tennessee. For more information, call Alan Pinney, AE4FC, at 423-478-1141. (Exams.)

March 2, **ICRC Annual Hamfest/Flea Market**, Bristol Eastern High School, Bristol, Connecticut. Contact Pete Brunelli, 358 Andrews St., Southington, CT 06489 (860-620-0176). (Handicapped accessible. Exams at 10 AM, by preregistration only. Send SASE to ICRC, P.O. Box 165, Pleasant Valley, CT 06063).

March 8, **Kentucky Mountains ARC Hazard Hamfest**, Hazard High School, Hazard, Kentucky. Contact John Farler, K4AVX, at 606-436-5354; or Sid Adams, WI4M, at 606-439-3589. (Exams.)

March 8, **Englewood, Florida HamCom '97**, Tringali Community Center, Englewood, Florida. Contact George Shreve, KA4JKY, 13591 Martha Ave., Port Charlotte, FL 33981 (941-697-3445). (Exams at 11 AM, walk-ins okay, for info contact John Fogle, WD7H, 941-697-7946.)

March 15, **The Shriners ARS of Kerbela Hamfest**, Kerbela Shrine Temple, Knoxville, Tennessee. For additional information, contact Paul Baird, K3PB, 1500 Coulter Shoals Circle, Lenoir City, TN 37772 (423-986-9562).

March 15, **44th Annual Kennehoochee ARC Hamfest**, Jim Miller Park (formerly Cobb County Central Park), Marietta, Georgia. Contact Margaret, KB4QKW, at 770-977-4405. (Exams.)

March 15, **Yuba Sutter ARC Swapmeet**, American Legion Post, Linda, California. For more information, call Ron, W6KJ, at 916-674-8533, or Clara, KC6JPP, at 916-742-2674.

March 15–16, **St. Patrick's Day Hamfest**, Midland County Exhibit Building, Midland, Texas. For more information contact the Midland ARC, P.O. Box 4401, Midland, TX 79704; or Larry Nix, N5TQU, via e-mail at <oilman@lx.net>; or download a registration form at <http://www.lx.net/edge/midswap.htm>. (Exams.)

March 15–16, **1997 ARRL Oklahoma State Convention**, Maxwell Convention Center, Tulsa, Oklahoma. For more information, call 918-622-2277; or e-mail <megriffin@ionet.net>; or see the hamfest page on the Web <www.greencountry.com/hamfest>. (Exams.)

March 16, **42nd Annual TMRA Hamfest/Computer Fair**, Lucas County Recreation Center, Maumee, Ohio. For more information, send SASE to TMRA, P.O. Box 273, Toledo, OH 43697-0273, or phone Paul Hanslik, N8XDB, 419-243-3836.

March 16, **The Sterling-Rock Falls ARS 37th Annual Hamfest**, Sterling High School Field House, Sterling, Illinois. For more info, send SASE to Sterling-Rock Falls ARS, P.O. Box 521, Sterling, IL 61081-0521; or call Lloyd Sherman, KB9APW, at 815-336-2434; or e-mail <lsherman@essexl.com>. (Exams, walk-in only.)

March 16, **Tri-County ARC Annual Hamfest**, Jefferson County Fairgrounds, Jefferson, Wisconsin. For more information, write to TCARC, W9MQB, 711 East St., Ft. Atkinson, WI 53538 (414-563-6502 eves.).

March 22, **Roseland Radio Club (IRAC) Hamfest**, West Orange High School, West Orange, New Jersey. For more information, call Jim, N2TDI, or Liz, N2WGH, Howe at 201-402-6066.

March 22, **MCARA 21st Annual FREE Hamfest**, Martin County Fairgrounds, Martin

(Continued on page 115)

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Results of the 1996 CQ World-Wide WPX SSB Contest

BY STEVE BOLIA*, N8BJQ

Three new operating categories and some very close races highlighted the 1996 WPX SSB Contest. This was the inaugural year for the Tribander/Single Element (TS), Band Restricted (BR), and Rookie categories in the WPX Contest, and they were well received. Nearly 100 entered the Tribander/Single Element category, and we had over 30 enter the Rookie category, many of whom were entering their first contest of any kind. Let's hope they enjoyed it and come back again.

VP2E ops. RX9JM, RZ9UA, RA9JX, and UA3DPX made the first ever true Russian contest expedition. Alex, Mike, Vadim, and Andy have promised to turn up at another exotic DX location in the future.

DX

In one of the closest races in recent WPX history, six top operators from three continents seriously challenged for the all band title. 3V8BB, using a tribander and wire antennas, a unique prefix, and a three-point location, was the big winner. Hrani's three-point location offset the 300+ QSO lead of runner-up HH2PK, operated by Ivo, 9A3A. Climbing from sixth in 1995 to third was Al, WR6R/WH7, with a new Oceania record followed by Carl, AI6V, at P4ØV and OH6XY at PJ9Y. Not far behind in sixth place was VD3EJ. John worked the most prefixes of any of the all band entrants. Rounding out the top ten were S5ØA, OT6T, GIØKOW, and 5NØT.

Ten meters belonged to Argentina with LU4HAW finishing number one, followed by LU3HWE, LU9HZS, LU3FZW, and ZPØZ. The second, third, and fourth place stations all were low power entrants. Ten meter conditions were down considerably from 1995, but we can hope that conditions have bottomed out and we will see more activity starting with the 1997 contest. ZX5J operated by PP5JR took 15 meter honors, followed by CW6V and PW4Y (PY4OY op.). PA3DZN at 9R1A finished fourth and AH8A came in fifth. On 20, 6V6U operated by K3IPK edged out OK1RI for the top spot, followed by FM5CD, YW1A, and IY2ARI. EA8AH just missed TE1C's world record on 40 meters. CY7A (VE7SV op.) took second, followed by VD7NTT, II3T, and AY1I. On 80, TE1C took a shot at the oldest surviving world record (1985 by OH1RY/CT3), but could not quite make it from North America. Carlos did, however, break the North American record. Second place went to YT6A with a new European record, with P4ØA third (VE3BMV returns) with a South American record. Fourth place went to UA2FJ, with USA champ KE1Y taking fifth. On top band, S54E edged out YU1ZZ for number one, with OM5CD third, OY9JD fourth, and 9A2TW fifth.

As one would expect, low power scores suffered due to the somewhat less than ideal conditions. While the scores were down, there still was plenty of good competition. The number of low power entrants continues to increase each year. For the first time low power world and continental records are being kept and will be appearing in *CQ Contest* magazine about the same time this issue of *CQ* hits the streets. FO5IW was the top single op, with OK1WF less than 50K behind. Third place went to LU2NI, followed by 9U/EA1FH and 9K2/YO2HP. Rounding out the top ten were Z30M, L44D, P29MO, K1HTV, and RA3WA. As stated earlier, the 10 meter low power guys fared very well. LU3HWE, LU9HZS, and LU3FZW finished first, second, and third in the low power category and second, third, and fourth overall. PP5UA turned in the top score on 15 meters, followed by LU8FOZ and LU2DW. IR9B led the way on 20, with LU5FCI second and US4LAD right on his heels. XE2DV (W7ZR op.) set a world low power record on 40 meters. 4V2B and SV2CWY finished second and third. On 80, HA8IB edged out S57J and DL4FMA for the top spot. T94ON established a new world low power record on top band with S5ØO second and '95 champ OZ3SK coming in third.

Getting an early start in contesting is Laura, AD4PU. Laura, who was 12 at the time of the contest, made over 330 QSOs in her first attempt at WPX contesting.

Single operator Assisted scores rose a bit, with UU5J and SØ7NY (EA3NY) both topping KA2AEV's 1995 winning score. UU5J finished on top with 6.6M, with SØ7NY second at 5.9M. Third place went to WAØPUJ, followed by SKØWJ and KF8UM. The low power leader was JF1SEK. The Assisted category is for both all band and single band, high and low power. JAØBMS/1 was the 15 meter champ, with S54ZZ edging out ON4DPP, DL7IO, and OK1DIG for 20 meter honors. IO2A led the way on 40. On 80 meters, DL5FDA just beat out IN3ASW for the top spot, and EA1DVY was tops on the top band. PY2PAH took low power

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TROPHY WINNERS

SINGLE OPERATOR, ALL BAND

WORLD: Stanley Cohen, WD8QDQ Trophy. Won by: **3V8BB operated by Hranislav Milosevic, YT1AD.**
USA: Atilano de Oms, PY5EG Trophy. Won by: **Bob Shohet, KQ2M.**
AFRICA: Peter Sprengel, PY5CC Trophy. Won by: **Pat Crepelliere, 5NØT.**
EUROPE: Jim Hoffman, N5FA Trophy. Won by: **Tine Brajnik, S5ØA.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Carl Cook, P4ØV.**
OCEANIA: Philip Fraizer, K6ZM Memorial. Won by: **Al Crespo, WR6R/WH6.**
***JAPAN**: The DX Family Foundation Trophy. Won by: **M. Maruyama, JA7BEW.**
WORLD QRP/p: Dayton Amateur Radio Association Trophy. Won by: **Gediminas Lucinskas, LY3BA.**
USA QRP/p: Doug Zwiebel, KR2Q Trophy. Won by: **Peter Archibald, N1AFC.**

SINGLE OPERATOR, SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **ZX5J operated by Sergio Lima de Almeida, PP5JR (21 MHz).**
WORLD (Low Power): Vern Fowler, W8BLA Trophy. Won by: **Pedro Schmitz, PP5UA (21 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Pekka Kolehmainen, EA8AH.**
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **William Faulkerson, AH8A (21 MHz).**
USA 3.7 MHz: Lance Johnson Engineering Trophy. Won by: **Rolf Seichter, KE1Y.**
USA 7 MHz: Lewis Sayre, N7AVK Trophy. Won by: **William Johnson, KVØQ.**
USA 21 MHz: Bernie Welch, W8IMZ Memorial. Won by: **John Desloge, Jr., N6MU.**
USA 28 MHz Novice/Tech: Jon Engelhardt, KAØZFX. Won by: **Vincent Plumbo, KB5FZO/T.**

MULTI-OPERATOR, SINGLE TRANSMITTER

USA: Oklahoma Comm Center Trophy. Won by: **KI1G operated by KI1G, K1NG, NB1U.**

MULTI-OPERATOR, MULTI-TRANSMITTER

NORTH AMERICA: Burt Curwen, KL7IRT Memorial (James Dixon, NL7HI sponsor). Won by: **KP4XS operated by KP4XS, KF3P, AA6KX, S55OO, K3JT, WD8ISK, ND3F.**
USA: Glenn Tracey, KC3EK Trophy. Won by: **WZ1R operated by WZ1R, KY1H, WM1K, AA1AA, KM1P, NE1V, NJ1F, WR2I, WA1ZAM, KE6BER.**
WORLD: Kansas City DX Club Trophy. Won by: **VP2E operated by UA3DPX, RA9JX, RX9JM, RZ9UA.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **VP2E operated by UA3DPX, RA9JX, RX9JM, RZ9UA.**

20 meter honors and DKØIU did likewise on 40.

QRP/p scores held their own despite the conditions. LY3BA took the top spot by less than 50K over RW9AB. YU1KN was right on his heels, followed by YU1EA and SP3SLA. ZW2WAL took the top spot on 10 meters, with JH1HRJ the 15 meter champion and YU1NR tops on 20. UA4SKW turned in a very nice 40 meter score, as did UX2MF on 80 and EU2MM on 160.

This was the first year for three new single operator categories. In the Tribander/Single Element category 3V8BB is the first champion, followed by S59A, LU7DW, VG3DRC, and 9U/EA1FH. All of these stations used a single triband beam and wire single-element antennas for the low bands to achieve competitive scores, and in the case of 3V8BB, the top score in the world. In the new Rookie category for new contesters, IU2E started with a bang with nearly 2.5 million points. Second place went to TJ1RA. Complete score listings of the TS, Rookie, and Band Restricted categories will be found in *CQ Contest* magazine.

USA

A couple of hundred QSOs and a handful of prefixes were all that separated the top four all band stations. Perennial front-runner KQ2M led the pack with KC1XX (AA1ND op.), KM9P, and K3ZO in a virtual dead heat. NB1B was fifth, with K5ZD, KW8N, KI4HN, K7RI, and WZ4F sixth through tenth place, respectively. N5NMY easily won 10 meters, wth W4YV second. N6MU was the 15 meter champ with N4BP second. N8II narrowly beat N3HBX and K5UA for the 20 meter title. KVØQ took 40 meter honors with KK6XN second. On 80, KE1Y turned in an outstanding score to finish first, followed by AB6ZV/7. AC4NJ took top band honors, followed by AA4MM.

K1HTV unseated WS1A as the low power all band champion. Third place went to WD5K, followed by NY5B and WA4ZXA. N5NMX won the low power 10 meter category, followed by WB4HFL and Novice/Tech winner KB5FZO/T. WA7BNM/7 retained his 15 meter title, followed by AC1O. N4MO did a nice job on 20 meters, as did AA7UN in second place. AA9IA just edged out W4YDD on 40. WA3RSK took 80 meter honors, as did N5IA on 160.

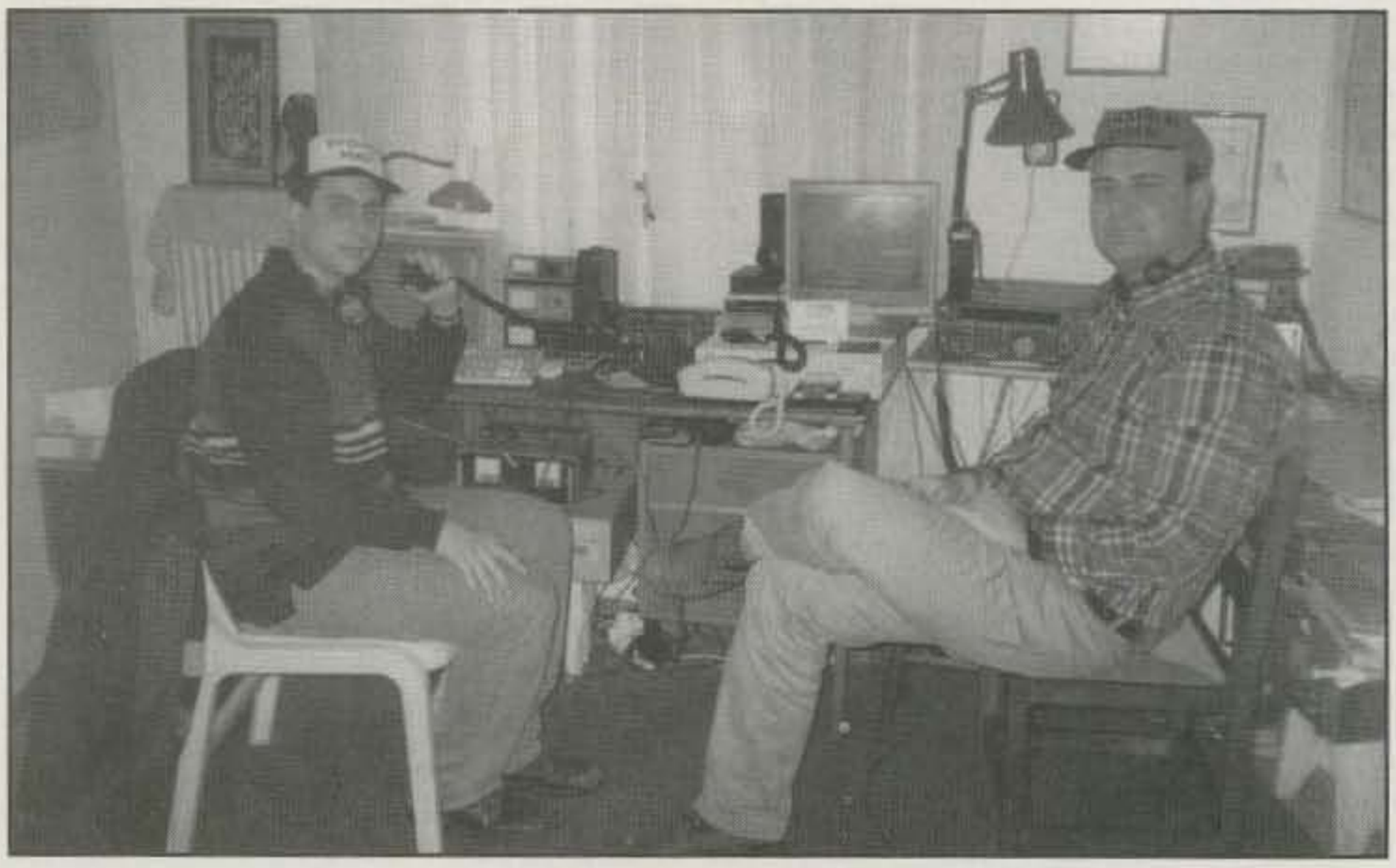
WAØPUJ was the top US Assisted station and also third in the world. Second place went to KF8UM, followed by KBØWY, K3SW, and KCØZC. K9OSH finished first on 20 meters. Remember, the Assisted category is for both all band and single band categories, as well as high and low power.

N1AFC repeated as the US QRP champion with WT3W coming in second and AA7VY third. WA6FGV also repeated as the 15 meter champion. W6CN took 20 meter honors, while W8QZA/6 won on 40 meters.

K4VUD was the first winner of the Tribander/Single Element category, followed by W6TKF, N5OKR, KC6X, and KG6LF. The top five broke the one million point mark. The top US Rookie was N1TMG, who beat KG8PE by 6000 points for the honor. KB2RAS, KE3TA, and ABØUJ rounded out the top five. Welcome to contesting, and we hope to see you back many more times.

Multis

The multi-single battle was won by the gang at ZXØF. PY5EG, N5FA, PY5CC, PY5GU, PYØFF, PY5GA, and PU5OMS enjoyed just a bit better conditions on their way to the win over HC8A operated by HC1OT, N6KT, and WN4KKN. Both stations beat 1995's winning score. Third place went to the first "all Russian" contest expedition team at VP2E. They got a bit sunburned, but enjoyed their trip to the Caribbean. Another Russian crew teamed up with WP4U to finish fourth, followed by the top



Andy, SV1DKD, and John, SV2DKR, did a two-man, low-power multi-multi (SV2DKR) effort. It was a lot of hard work, but they did have fun.

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KENWOOD

TS-570D HF Transceiver

- 100W HF Transceiver, 12VDC
- QSK • CW Auto Tune • Autotuner
- DSP • Large LCD Display • Elect. Keyer
- RCP2 Radio Control Program Compatible

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TS-870S HF Transceiver

- DSP in I.F. Stage! • 100W, 12V DC
- Dual mode noise reduction
- Digital Filtering (no opt. filters req.)
- Built-in RS232,Windows software incl.

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TS-50S/TS60S HF Trans. • 6M

- TS-50S - World's smallest HF trans.
- 100W out, (90W TS-60S, 50MHz only)
- SSB, CW, AM, FM. • 12V Gen. Cov. RX,
- 6.4 lbs., 7.16 x 2.4 x 9.32"
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- Opt. ext. ant. tuners available (TS-50S only)

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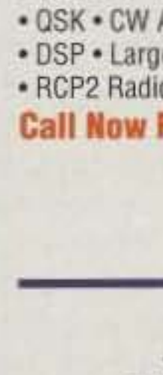

TH-79A(D)
2M/440HT

New Deluxe Model!

- 2.7W 2M, 2W 440
- 5W Opt., DTSS Built-In
- 82 Mems, DTMF Mems
- Built-In CTCSS Enc./Dec.
- User-Friendly Menu Sys.

Call Now For Special Low Prices!

5w High Power Also Avail.

TM-261A 2M Mobile

- 50W + Mid and Low • Mil-Spec
- 61 Memory Chanels
- Alpha Numeric Function
- Dual Menu, DTMF Memory
- Backlit mic & built-in encode

NEW!

NEW!

TM-V7A 2M/440Mhz

- 50W/35W • 280 Mems • Visual Scan
- Alpha Numeric • Enc/Dec & Duplexer Built-in
- Computer Programmable • 9600 Baud Ready
- Cool-blue Reversible LCD • Backlit Mic

Call Now For Intro. Low Price!

TH-28A

- 2M/2.5W DTSS
- 240 Mem. w/opt. memory unit
- UHF RX

5w High Power Also Avail.

TH-22AT

NEW!

- Ultra Compact
- 2M HT, 5W optional
- 40 memories
- Encode Built-In

TS-570S HF + 6M Transceiver

- 100w HF, 100w on 6M, 12vDC
- QSK, CW Auto Tune • Autotuner incl 6M
- DSP • Large LCD Display • Elect. Keyer
- RCP2 Radio Control Program Compatible

NEW!

Call Now For Your Low Price!

TM742AD 2M/440Mhz

- Optional 3rd band available • Back-lit mic
- Up to 303 memories • 101 per band
- PL Encode Built in • Detachable front panel

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WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

3V8BB	**12,604,241**
HH2PK	11,634,343
WR6R/WH7	**11,258,410**
P40V	**11,141,648**
PJ9Y	10,099,584
VD3EJ	9,640,540
S50A	**7,961,022**
OT6T	7,319,598
GI0KOW	6,160,091
5N0T	**6,043,488**
KQ2M	**5,281,200**
CQ4DIZ	5,183,808
KM9P	5,035,392
KC1XX	5,007,100
K3ZO	4,969,545
4N0AV	4,720,330
YT1BB	4,605,106
S59A	4,597,645
S58AB	4,501,896
OM7DX	4,410,008

28 MHz

LU4HAW	606,816
*LU3HWE	309,657
*LU9HZS	281,750
*LU3FZW	271,040
ZP0Z	209,600

21 MHz

ZX5J	**8,632,268**
CW6V	6,238,998
PW4Y	5,611,370
9R1A	4,728,856
AH8A	**4,165,080**

14 MHz

6V6U	4,960,836
OK1RI	4,544,304
FM5CD	3,819,216
YW1A	3,791,009
IY2ARI	3,223,102

7 MHz

EA8AH	**7,101,380**
CY7A	5,971,896
VD7NTT	4,379,200
II3T	3,423,168
AY1I	3,289,652

3.5 MHz

TE1C	2,161,568
YT6A	1,976,436
P40A	1,715,076
UA2FJ	1,323,168
KE1Y	**1,280,912**

1.8 MHz

S54E	382,910
YU1ZZ	346,326
OM5CD	220,818
OY9JD	213,380
9A2TW	176,784

LOW POWER ALL BAND

FO5IW	3,933,336
OK1WF	3,878,263
LU2NI	2,827,360
9U/EA1FH	2,635,218
9K2/YO2HP	2,435,862
Z30M	2,207,672
L44D	1,404,557
P29MO	1,403,231
K1HTV	1,325,985
RA3WA	1,214,132

28 MHz

LU3HWE	309,657
LU9HZS	281,750
LU3FZW	271,040
LU4FCZ	166,004
CX8CP	131,217

21 MHz

PP5UA	**2,715,072**
LU8FOZ	1,694,420
LU2DW	1,540,768
EA8AKN	1,500,741
LU1HTF	1,087,124

14 MHz

IR9B	1,862,350
LU5FCI	1,448,500
US4LAD	1,441,196
LU1ICX	1,182,275
JH7VHZ	1,075,778

7 MHz

XE2DV	2,414,320
4V2B	1,206,200
SV2CWY	500,640
DL1FDV	493,506
T97V	271,392

3.5 MHz

HA8IB	487,770
S57J	423,752
DL4FMA	407,376
WA3RSK	355,752
SV2AEL	283,860

1.8 MHz

T94ON	172,032
S50O	131,460
OZ3SK	122,112
OK1NG	114,204
OK1FFU	105,376

ASSISTED ALL BAND

UU5J	6,621,225
S07NY	5,933,645
WA0PUJ	2,055,456
SK0WJ	1,738,692
KF8UM	1,526,460
S59AA	1,248,628
S57W	1,114,648
KB0WY	1,023,144
IK2HKT	1,001,988
*JF1SEK	793,324

21 MHz

JA0BMS/1	25,864

14 MHz

S54ZZ	1,440,306
ON4DPP	1,131,612
DL7IO	1,030,778
OK1DIG	1,006,604
OI3NXW	752,124

7 MHz

IO2A	551,892

3.5 MHz

DL5FDA	622,728
IN3ASW	517,992

1.8 MHz

EA1DVY	6,400

LOW POWER ALL BAND

JF1SEK	793,324
OK2BEE	201,481
JK2VOC	190,390
S50U	172,200
ND8L	171,360

14 MHz

PY2PAH	50,806
JH7QXJ	25,745

7 MHz

DK0IU	43,420

TRIBANDER SINGLE ELEMENT

3V8BB	12,604,241
S59A	4,597,645
LU7DW	4,546,237
VG3CRC	3,236,322
*9U/EA1FH	2,635,218
VY2LI	2,299,752
K4VUD	1,779,657
EA3GHQ	1,641,932
W6TKF	1,406,674
*L44D	1,404,557

ROOKIE

IU2E	A	2,472,666
TJ1RA	A	1,511,552
IK0YUT	A	1,241,009
PU2MHB	28	110,400
VK3NDS	21	159,030
SM6JOC	14	8,214
S57LOB	3.7	120,540

QRP/p

LY3BA	**A**	**605,581**
RW9AB	A	559,112
YU1KN	A	536,469
YU1EA	A	514,512
SP3SLA	A	476,560
ZW2WAL	28	66,232
LU7VCH	28	45,714
LU7FEU	28	22,680
JH1HRJ	21	33,288
S59D	21	26,319
YU1NR	14	483,408
I0FHL	14	286,275
W6CN	14	72,890
UA4SKW	7	79,002
DL1DQY	7	39,032
W8QZA/6	7	5,076
UX2MF	3.7	115,670
YL1ZF	3.7	67,200
SP4GFG	3.7	30,856
EU2MM	1.8	20,864
YO4FRF	1.8	6,200

MULTI-OPERATOR SINGLE TRANSMITTER

ZX0F	23,896,640
HC8A	21,830,848
VP2E	**11,365,590**
WP4U	11,308,155
IR4T	10,134,075
TM1C	10,099,496
LZ5W	9,255,480
TK1A	9,153,720
XR8S	7,675,670
TA2II	7,619,980
CT8T	7,308,004
TO5T	7,049,145
RU3A	6,931,815
OEM2S	6,817,482
VE6SV	6,033,529
VC3SK	5,978,544
DJ6QT	5,814,450
OH2IW	5,759,190
KI1G	**5,737,375**
IQ4T	5,573,800

MULTI-OPERATOR MULTI-TRANSMITTER

KP4XS	**19,590,387**
9A1A	19,280,784
OT6A	18,190,766
WZ1R	**11,214,770**
PA6WPX	10,685,010
WT1S	10,656,380
EM2I	10,076,904
WM2C	8,958,978
VD6JY	7,919,121

**Indicates low power.*

European finisher, IR4T. TM1C, LZ5W, TK1A, XR8S, and TA2II completed the top ten.

KP4XS and 9A1A retained their positions on top of the multi-multi category. Third place went to OT6A, followed by USA champ WZ1R and PA6WPX. The top two were very close, separated by only 300K.

KI1G operated by KI1G, K1NG, and NB1U edged out WE9V operated by WE9V, KS9K, N0BSH, and WX9E for the USA multi-single title. Chad, Paul, Mike, and Paul had a few more QSOs and prefixes, but could not quite overcome the low band advantage held by KI1G. KT8X finished third, and was followed by NE8T and W5KFT.

WZ1R repeated as the multi-multi champion, holding off a serious challenge from the guys at WT1S. Finishing third was WM2C with a nice score from the west coast. NE9U was fourth and AB4JI fifth.

The Rest of The Story

We again had a large number of special prefixes, contest expeditions, and DX stations on for the contest. Thanks to ZX0F, HC8A, VP2E, WP4U, TO5T, 3V8BB, 5N0T, 9R1A, 6V6U, AH8A, EA8AH, P40A, TJ1RA, J56CK, HS50A, OD5NJ, 4H9RG, and ZK2ZE, along with many others who helped keep the multiplier count up and the contest fun.

Thanks again to N6AA and N6TR for the database help. More logs were run through the process this year due in large part to the increase in electronic log submissions. A disturbing trend was seen this year with an increase in the number of "bad" calls appearing in some logs. "Bad" calls are calls that can definitely be proven to be bad due to several possible reasons, such as having never been issued, incomplete calls, or calls that just plain don't make any sense. Much has been written on this subject. When you get an unusually high number of bad calls, it usually means that you are not really copying the station you are working, and the result can be disqualification. Bad calls are different from the famous "uniques." Uniques are not removed unless we prove via cross-checking that the call was definitely bad.

Again this year logs can be submitted via e-mail to **N8BJQ@ERINET.COM**. We would like to see your *.bin file, *.dat file, or *.log along with an ASCII summary sheet and a multiplier sheet. If we need more, we will ask. If you don't use any of these programs, we can use a dBase compatible file or an ASCII log file. Logs received via e-mail will be confirmed via e-mail.

If you prefer to send your log via regular mail, please include a disk with the above files if you used a computer for logging or scoring. It makes our life a lot easier. Paper logs are not required if you send a disk with the above files included. Please check your disk to make sure there are actually files on it and it is formatted. Each year we get a couple of completely blank disks and one or two that are not even formatted. The percentage of unreadable disks is quite low, with only a couple found to be bad this year. Please run an anti-virus check on your disks also. My anti-virus checker gets a workout when I process the disks. This year it caught them all (over 20 different ones).

Thanks go to Sergio, EA3DU, for his help with the all of the logs that are sent to the Spanish *CQ* offices. Also thanks to Scott, N9AG, for all of his help. If you are interested in doing some WPX log checking, please get

Say You Saw It In CQ

JRC

JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245

1. All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.
2. MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.
3. AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.
4. MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.
5. GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.
6. IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.
7. QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.
8. NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.
9. DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.
10. CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.
11. DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.
12. 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.
13. COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.
14. ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.
15. HEAVY-DUTY POWER SUPPLY • Built-in switching power supply and a cooling system designed for continuous transmission at maximum output.

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USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	**5,281,200**
KC1XX	5,007,100
KM9P	4,959,552
K3ZO	4,919,772
NB1B	4,212,252
K5ZD	3,324,540
KW8N	3,183,530
KI4HN	3,026,079
K7RI	2,983,572
WZ4F	2,875,037
K7QQ	2,735,016
WZ3Q	2,501,935
KA4RRU	2,331,348
K6HNZ	1,851,300
K4VUD	1,756,412
NB7N	1,734,486
AI2C	1,415,910
W6TKF	1,414,656
N5OKR	1,350,701
*K1HTV	1,319,490

28 MHz

N5NMY	67,084
W4YV	29,889
*N5NMX	24,528
*WB4HFL	6,580
***KB5FZO/T**	**5,994**

21 MHz

N6MU	**266,760**
N4BP	156,123
*WA7BNM/6	134,096
W5ASP	99,180
*AC1O	49,558

14 MHz

N8II	1,515,816
N3HBX	1,422,408
K5UA	1,263,032
*N4MO	638,990
W7FP	606,618

7 MHz

KVØQ	**1,629,744**
KK6XN	1,003,968
W3GH	775,390
WM2V	286,896
KØJN	150,920

3.7 MHz

KE1Y	**1,280,912**
AB6ZV/7	809,432
*WA3RSK	355,752
AE4MJ	36,736
*K9FOH	19,584

1.8 MHz

AC4NJ	32,606
AA4MM	14,280
*N5IA	4,350
KØCS	2,622
K4JYO	1,804

LOW POWER ALL BAND

K1HTV	1,319,490
WS1A	1,043,952
WD5K	706,200
NY5B	674,422
WA4ZXA	670,338
ACØW	601,344
NA2Q	551,642
KD1YN	518,367
W7ZMD	495,112
KJ6HO	483,912

28 MHz

N5NMX	24,528
WB4HFL	6,580
KB5FZO/T	**5,994**
W9CNF/M4	410

21 MHz

WA7BNM/6	134,096
AC1O	49,558
NP4IW/WX6	28,886
KU6T	24,794
KI4DC	8,512

14 MHz

N4MO	638,990
AA7UN	444,788
AKØA	389,994
KB8IBS	238,620
K2BQW	185,072

7 MHz

AA9IA	40,960
W4YDD	32,364
N8LIQ	19,750
W2FGY	17,864
WA5JWU	8,320

3.7 MHz

WA3RSK	355,752
K9FOH	19,584

1.8 MHz

N5IA	4,350

ASSISTED ALL BAND

WAØPUJ	2,055,456
KF8UM	1,526,460
KBØWY	1,024,212
K3SW	642,470
KCØZC	588,720
N1NQD	571,725
N6CCL	502,944
KA7ZUM	415,905
N8BJQ	412,192
K2LE	373,842

14 MHz

K9OSH	1,122

TRIBANDER/ SINGLE ELEMENT

K4VUD	1,779,657
W6TKF	1,406,674
N5OKR	1,350,701
KC6X	1,056,783
KG6LF	1,002,600

ROOKIE

N1TMG	A	309,738
KG8PE	A	303,222
KB2RAS	A	136,713
KE3TA	A	67,332
AAØUJ	A	52,608

QRP/p

N1AFC	**A**	**364,192**
WT3W	A	218,316
AA7VY	A	164,651
KA1CZF	A	135,044
WA6FGV	21	2,806
W6CN	14	72,890
KC6ETY	14	48,565
W4DEC	14	46,294
W8QZA/6	7	5,076

MULTI-OPERATOR SINGLE TRANSMITTER

KI1G	**5,737,375**
WE9V	5,362,680
KT8X	3,881,241
NE8T	3,723,785
W5KFT	3,661,928
K1KP	3,175,935
WU7Q	3,100,902
KC7V	2,629,989
KF9PL	2,137,240
NCØP	2,089,044

MULTI-OPERATOR MULTI-TRANSMITTER

WZ1R	**11,214,770**
WT1S	10,656,380
WM2C	8,958,978
NE9U	2,719,500
AB4JI	1,628,946
KF9YT	852,150

**Indicates low power.*

in touch with me. The requirements are not too tough. You must have a computer, access to e-mail, and some "free" time.

The 1997 contest will be held on 29–30 March. If you need log sheets, get your SASEs to *CQ* early and mark plainly on the envelope that you need log sheets. Previous results, contest records, and other WPX information will be available on the WPX Web page at **http://ourworld.compuserve.com/homepages/n8bjq**. This site will be updated frequently. Hope to work you in the 1997 contest!

73, Steve, N8BJQ

Random Comments—USA

Operators John, Mike, and Liz Thompson, K3MD, N3PUR, and N3NWN, ages 46, 13, and 16. . . . *K3MD.* Fun contest, new call next year. . . . *KC5RMW.* 7X2LS and XU6WV called us. Great conditions on 20 meters. . . . *KI7WX.* HS5ØA called on Sunday morning to let me know I was "heard" on 80 the night before! Need better ears. . . . . *NE3F.* Great fun for a bunch of non-contesters to mix in and run a score. . . . *NX3Y.* Very close competition from our friends at K1MNS signing WT1S. . . . *WZ1R.* Running QRP sure is different than running with full legal limit. Lots of patience from the other Ops. Looking forward to the increasing sunspot cycle. . . . *AA7VY.* Best score in this contest so far for me. . . . *N8AXA.*

First time ever in a QRP contest. Spent 12 hours to make 38 QSOs on 20 meters. Spent one half hour calling OA4EI. I have to say it was quite an experience not to have any neighbors knocking on my door. . . . *NI3I.* Thanks to all those fine operators who pulled me through the horrific QRM. . . . *W4DEC.* It's tough to stay awake that second night when you are operating 40 meters QRP. . . . *W8QZA/6.* Rough QRM. Didn't take the WPX by storm; still had fun. . . . *WD9IAB.* Before I die, I would like to read John Dorr's "run through" of this contest if he ever operates from the black hole of Minnesota. Condx were terrible, but it's still an exciting contest. . . . *AAØSQ.* The DX and their signals were excellent. . . . *AA7UN.*

As always, I had a great time, but where are the American stations with all those terrific prefixes? . . . *AA9IA.* Switching for a listen on 10 meters on Sunday and finding some ZW's chatting, but nobody else on the band. I threw in my call and the opening was on. I did a quick S&P scan and worked everybody I heard, and then found a frequency (it wasn't hard) and established my only successful run for the whole contest. It lasted both minutes of the opening. . . . *AB6YL.* My first both afternoons. . . . *AI2C.* First time in three years we were not threatened by thunderstorms. . . . *KØCS.* It was really nice to hear some old friends again, especially KL7RA. This contest is FUN! . . . *K1DWQ.*

First time I entered this phone contest—great fun. Will be back again next year. . . . *K4UK.* It was impossible to find a clear frequency on 20 meters! . . . *K5ZD.* Conditions sure were weird, for solar flux. Big surprise was 7X2LS and 9HØDX answering my CQ. When will there be a new category for over-60-year-old ops? . . . *K7QQ.* Nice contest as always. It is fun to hunt for the unusual prefixes which make the contest interesting. . . . *KB4GID.* Nice to have a new Tribander/Single element class available. Maybe now I'll have a chance. . . . *KC6X.* Great test. Nice to work 9M8, HS5, SØ7 with low power. . . . *KD1YN.* Best score and best contest all year. . . . *KD4BK.* New categories seemed to encourage lots of new activity. Good to see an opening on 10 meters. . . . *KG6LF.*

I had a wonderful time operating this contest. This is the first time that I have operated this contest competitively. I can't wait to operate it when sunspots come up (age 12). . . . *KG8PE.* Remember when 10 meters would open? Will it ever open again? . . . *KI4KR.* Having been a ham only since January. It was a big thrill for me to work all continents on 20 meters, and encouraging to know that it can be done barefoot and "beamless." . . . *KQ6ES.* As was the case during the last sunspot minimum, contesting becomes more work and less fun. . . . *KW8N.* Suffered some deliberate jamming for part of the contest. Otherwise conditions were very good. . . . *N3HBX.* In last 10 minutes worked NA, SA, AF, EU, and OC. Condx very spotty. . . . *N4BP.*

Heavy QRM on 20; good opening on 10; amazed to work stations in Croatia. . . . *N4EUK.* As difficult as low power is, I can't imagine what QRP would entail. . . . *N4MO.* I never heard so many new prefixes before at one time. Several local club members took time to work myself and other local participants. Several of them were mults while others were not. One even worked me on his 2 meter vertical. Most of them are still anti-contest, however! But, people change. . . . *N5NMX.* I feel very fortunate to have my station located in such a super quiet area, free of electrical line noises, static crashes, and at the time, no thunderstorms. It sure helped me in pulling out a lot of weak signals on 10 meters. . . . *N5NMY.*

Fun contest, as always. Eager to see how the new categories work out. . . . *N5XUS.* Used my MFJ-432 Voice Keyer for the first time. Didn't make more QSOs, but saved my voice. . . . *N6SMW.* Only in the WPX can you make 1100+ QSOs and every other QSO on the average is a multiplier. This was one of the best contests ever for good conditions to Europe on 20 meters. Signals were strong from before 1130Z and DL, I, and EA were still very loud at 2200Z Sunday. . . . *N8II.* Pretty good conditions on 40 meters for low power operations. . . . *N8LIQ.* Well, this was my first WPX contest, and though I can't compete with the big guns, I hope to have learned a little bit more to help me in the next contest. It's hard to get a decent signal out of a townhouse with all the imposed restrictions. I even took some time to crawl around in the attic to make a few adjustments hoping to improve my signal. I even managed to work a couple of stations on 80 meters, but it was certainly a struggle. I'm looking forward to working the next contest. . . . *N9OGE.*

One-sixty and 80 meters were very noisy Saturday night. Many Europeans don't listen up on 80 and 40. Many easy 6 pt QSOs are lost because of it. Biggest surprise in contest was all of the Far East stations that answered my CQs in the last hours of the contest. . . . *NB1B.* An inconsistent but persistent S9+ powerline noise problem kept me from operating full time. . . . *NT5D.* Enjoyed the contest; this is one of my favorite contests. . . . *NZ5O.* Conditions were poor. No Europe, few W/VE (backscatter), and only a few

Say You Saw It In CQ

CONTINENTAL LEADERS

AFRICA

1.8	No Entrant	
3.5	EA8EA	1,043,460
7	EA8AH	7,101,380
14	6V6U	4,960,836
21	9R1A	4,728,856
28	No Entrant	
AB	**3V8BB**	**12,318,912**

ASIA

1.8	No Entrant	
3.5	JAØJHA	335,384
7	RVØAR	1,699,968
14	YM2ZW	2,562,296
21	4X/OK1JR	847,926
28	JH6AUS	7,150
AB	OD5NJ	4,032,536

EUROPE

1.8	S54E	382,910
3.5	YT6A	1,976,436
7	II3T	3,431,232
14	**OK1RI**	**4,544,304**
21	SN2B	4,027,706
28	EA7BA	5,168
AB	**S5ØA**	**8,211,376**

NORTH AMERICA

1.8	AC4NJ	32,606
3.5	TE1C	2,161,568
7	CY7A	5,971,896
14	FM5CD	3,819,216
21	**N6MU**	**266,760**
28	N5NMY	67,084
AB	HH2PK	11,634,343

OCEANIA

1.8	No Entrant	
3.5	No Entrant	
7	N6VI/KH6	2,831,532
14	WH6CQH	2,698,162
21	**AH8A**	**4,165,080**
28	ZL1AXB	49,941
AB	**WR6R/WH7**	**11,258,410**

SOUTH AMERICA

1.8	YV2IF	16,758
3.5	P4ØA	1,715,076
7	AY1I	3,289,652
14	YW1A	3,791,009
21	**ZX5J**	**8,632,268**
28	LU4HAW	606,816
AB	**P4ØV**	**11,141,648**

MULTI-SINGLE

AF	CQ3B	4,415,738
AS	TA2II	7,619,980
EU	IR4T	10,234,755
NA	**VP2E**	**11,701,794**
SA	ZXØF	23,896,640
OC	VK4MZ	3,805,206

MULTI-MULTI

AF	No Entrant	
AS	JO1YAO	613,536
EU	9A1A	19,204,080
NA	KP4XS	19,590,387
SA	No Entrant	
OC	No Entrant	

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CIRCLE 32 ON READER SERVICE CARD

C.A. and Caribbean. Pacific surprisingly active, especially VK/ZL. This has got to be the "minimum." . . . *W5ASP*. Band was really crowded. Had a hard time breaking KWs. Good European openings. . . . *W5RNF*. A personal best for myself on 20. Highlights included being called by A61AN and also working 3V8BB—just some of the DX to be found this weekend. . . . *W7FP*. Worked two TJ's during the contest. Not Europe and only 27 Asians. . . . *WA7BNM/6*. Best conditions on 10 for months. . . . *WB6NFO*. Haven't operated much on 20 meters; was quite happy to find that my antenna compared favorably with much more elaborate antenna systems used by other stations. . . . *WB8MWI*. Was everything long path?. . . . *WB8O*. Biggest thrill was breaking through to OD5NJ and having him remember that I was the first station he had ever worked. . . . *WS1A*.

Random Comments—DX

This is the first contest I've done since my million point efforts as HL9YG and KD5YG/TF. Scrap those $#%@ amplifiers, and please listen to callsigns. Next time you CQ Japan, and a 7J with a western accent comes back, check your prefix allocations; we are NOT in Central America. . . . *7J1AUO*. To my regret, I lost the opening 7 hours for business. Then I was back to shack, did my best, and beat my record at last few hours! Anyway, thanks to SØ7NY for the new one. . . . *7M1MCT*. Limited space at the QTH (tnx Mark, 9H1GP) so only dipoles at low height could be used on 40 and 80 meters. Had a lot of fun anyway. . . . *9HØDX*. It was a horror! Imagine: you go on a DXpedition, you call CQ Contest, and no one comes back on the crowded bands! Further on, in the midst of the test, we had to change farmhouses. . . . *9H3YY*.

Sorry for not being able to operate also on 160 meters. Fifteen meter band was great, but 10 meters was dead both days. . . . *9K2/YO2HP*. Although 15 meters was in good shape, unfortunately no US or JA runs. Nine radio(s) one Alpha is not my station description, unfortunately! Could not operate the amplifier at all times due to power cuts other extreme. In spite of this, and sometimes exceptionally high QRN levels, it was a great pleasure to operate this contest again. . . . *9R1A*. I enjoyed the contest with a small gun. . . . *BG4DW*. Everybody had a hard time with my call, and the computer also had a problem. . . . *BY1QH/K1VWL*. Thanks to the nearly 900 JA's who helped make this contest fun on 40 meters. . . . *CY7A*. 100 W + no turnable beam for higher bands = no chance to win. High power stations made QRM greater than 59 + 20 dB on every band. I don't know if I take part in 1997. . . . *DL1RNH*.

Hello, I'm 18 years old and this is for me the first contest on the SW. Super contest. . . . *DL8BEV*. At Sunday early morning, a spring allergia goes to QRT my throat. SWL follows but we'll heard us in CW next month!. . . . *EA3ALV*. It took very long time to catch S92YL (new one for me). . . . *F5RAB*. Although final score and propagation were not outstanding, I had fun and I will be back again next year. . . . *F6FGZ*. First time in the contest. Four new all-time countries, 17 new band countries, and numerous new prefixes, plus a heck of a lot of fun along the way. . . . *GØKRL*. TE1C was my best DX ever on 80 meters mobile and HC8A on 40 meters gave me my 150th zone worked while operating mobile. . . . *G4NXG/M*.

Hardest work for those contacts I've had in a long time. . . . *GD/AI5P*. Just playing around in the contest with our new club call. Only four GM6's in existence at the moment for HF use. . . . *GM6MD*. Big problems with 80 meter antenna = only 23 QSOs on the band; must have cost me at least 400 contacts! . . . *GW4BLE*. Doesn't matter propagation is bad; contesting is still fun. I always want to quit at the beginning, but when the score starts going up, my feelings change. CU on CW. . . . *HH2PK*. Always a nice contest, even with a small setup and vertical antennas is possible to have great fun. . . . *I6NOA*. Good contest but the rig is old and I'm happy for the few contacts. . . . *IK7WPD*. First experience with my new antenna just ready for WPX (3 el. quad dual driven W6PU). WOWWW! 40 meters became easy. . . . *IO2A*.

For the first time I have participated in this contest like single operator 40 meters and I had the time of my life. . . . *IR1A*. Tnx FB contest. Condition is not good. I operated on 18 hr. . . . *JA6BIF*. I enjoyed WPX in new shack for contest facing W about 300 meters above sea level. . . . *JH6SQI*. My second WPX, and just as fun and exciting as last year. Must get a PC for next time. Log checking is really hard brainwork (hi). . . . *LA2MJA*. It was my first attempt as single operator all band. I finished as exhaust as if I had get the first place in NY marathon. . . . *LU7DW*. Making a contest on 10 meters at the bottom of the cycle is like to make contacts with friends on 80 meters, funny but not exciting. . . . *LW2DBM*.

Was funny to celebrate my first anniversary as contester using new rig and antenna. See you in 1997. . . . *LW7EGO*. Due to housekeeping and my job as kinesiologist on duty, I couldn't linger longer in the contest. Maybe in 97 will be able to fulfill it. . . . *LW8EXF*. Nice contest but not too many US stations on the band. . . . *OEM8Q*. This is my very first entry for the WPX contest! I got my license late November 1995. I have been rather active chasing anything, but this contest gave the opportunity to work four new ones: KL7, CP, VS6, and P29. Can hardly wait for the CW part. . . . *ON4CAS*. Great contest. Too bad 10 was entirely closed. . . . *ON9CCQ*. I blew my TS930 before contest, tried to run on ICOM 735 (wide as a barn door, slow AGC, sounded like mashed potatoes), one leg of inverted Vee broke off and shorted to Delta Loop, got headache from glasses being too weak for the distance from my eyes. What an awakening! Glad to be back to ham radio. Looking forward to more fun in upcoming contests. . . . *P40A*.

Great contest but some of the eastern block stations were splattering over 20 kHz. . . . *PA3AEB*. TS category came right in time! I had no chance to put up bet for 80/40 meters two days before contest. Beautiful idea for new categories! . . . *S59A*. Enjoyed working the 20 meter long path opening to the Far East and the Pacific Ocean. . . . *SO5TW*. QRN level in general was +10 dB higher than normal here (rainy season

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Tones:		38	38
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CIRCLE 22 ON READER SERVICE CARD

Here are the operators at 9A1A, the top European multi-multi. Left to right are 9A9A, 9A5W, 9A6A, 9A2R, 9A2DQ, 9A7R, 9A2B, 9A2SD, 9A3TW, and 9A3GW.

is 30 days ahead of usual). Wall to wall activity from Europe down to 3.6 MHz! Could only work strong EU directly on first day. Weak ones impossible, as EU QRM would bury my signal. . . . *TE1C.* Very nice WPX 96. My new record—1299 QSO for long-time activity in contests all year since 1975. . . . *UAØSJ.*

TU for good contest. I'm 14 years old. . . . *UA1ZKZ.* My first WW WPX contest. Many thanks and best wishes from Uzbekistan. . . . *UK8IG.* Contest was going well until I decided to do a major antenna job, which took me off the air for most of the weekend. . . . *VE1RJ.* My first HF contest. I'm never going to stop contesting. . . . *VE2JTX.* This is my first WPX contest on North American land (VE-land). Thanks for very nice contest (ex-T92X). . . . *VE2XAR.* I am acting as K3EST's assistant in gathering technical information for WRTC-96 and the response from team members to my call was quite a thrill. . . . *VE7NKI.* Canadian Red Cross Headquarters. 100th Anniversary special event station. . . . *VG3CRC.*

Extremely poor conditions. Very often the band was closed or short skip only. This was my 397th contest. . . . *VK2APK.* Not my best. Impossible with just dipoles and QRP. A good Samaritan neighbor delivered a load of wood and caught the tower guy wires with the cab of his truck and gave the tower a 35 degree list to north. (Yagis don't work broadside.) Then my amp went "bang" and it was QRP and dipole antennas. But I enjoyed saying hello to old friends. . . . *VK2AYD.* I expected little and had a very enjoyable contest. Propagation seems to improve when we have a contest. . . . *VK2VM.* Thank goodness for good operations on 15. Once again I just missed out on getting to the next mil. Have officially entered the contest and must say that I thoroughly enjoyed it. Thanks for providing the opportunity for a fun weekend of amateur radio. . . . *VO1DC.*

Hope ol' Sol generates some spots for next year. . . . *VO1MP.* Not much volcanic activity until day before we left. Then it got pretty bad. The people of Montserrat have a terrible problem. . . . *VP2MGF.* Very tuff going—low power. I wanted the challenge but? . . . *VP5JM.* Contesting tough when TVI rears its head on XYL's TV. No problem with off time. It was dictated. . . . *VY2LI.* Contest operated from the contractor site of the world's largest geothermal power plant. . . . *WD5AAH/DU5.* It was my first WPX Contest that I worked. I'm very glad to be in it. My score was not high but was very fun. . . . *XE1HKR.* Sorry for few QSOs, but bad propagation here. Tnx for best contest in the world. . . . *YC6PUP.*

Thanks my first CQ WW WPX SSB Contest! . . . *YL2EC.* The EU QRM was terrible. It's unbelievable what is going on in EU during the big contests. Where is the power limit of some stations? . . . *YM2ZW.* Despite the lousy propagation, I had a lot of fun testing a new and excellent transceiver as the TS-870 is and enjoying the high participation in the bottom of the solar cycle. . . . *YO3JF.* It seems that sleeping is stronger than DX on low bands. It was my problem. . . . *YT1BB.* Good opening in the first hours, but not too much stations in the air. In the second day only two stations from Europe. . . . *YV2IF.* Worked China again. First time in eight years. . . . *ZC4EE.* The band was almost closed all the time during the contest but was fun the last two hours. . . . *ZPØZ.*

To collect points during daylight hours on 40 meters in South Africa with no active neighboring countries is a challenge. To break into the 40 meter band at night hours, which is so crowded by Europeans, is no less challenging. . . . *ZS6IR.* This is the first time I tried QRPp, but my neighbours and my good experience after so many years spent with high power operating HGØD before. . . . *HAØDR.* The band condition was not too good, but West Coast signals were reasonably strong for QRP work. HC8 and YC contacts were really my good surprise. . . . *JH1GNU.* Is my first QRP contest. Is very interesting. . . . *LU7FEU.* First time in two years I have been able to work Europe "first call" QRP in a contest. . . . *VE6GK.*

Very nice contest. Saturday night I was busy with job and I lost many QSOs. In QRP it is difficult to work in this band. I pronounced my call in many language. When was finish, my throat was over. . . . *YO4FRF.* We had a big snowstorm during the contest. First time for 20 years contesting WPX we had snow on the ground. Our youngster, DL1MGB, make a snowman outside. . . . *DF7RX.* Band condx very bad, QRM! Hope next year everything will be better! . . . *DJ6QT.* Reached nr 1975 (birth year) at 1620 (exact time I was born) during the second day of the test (my birthday). . . . *LU4AA.* Happy to exceed 1995 score despite lower sunspot number and less prefixes worked. . . . *OEM2S.* Our warmest regard to the mysterious "Mr/Ms Bleep-sound"! Your timing was remarkably good, until you "got caught" with that tiny error in keying "k"! . . . *OH2IW.*

This was a Belgian contest expedition. All of the equipment was bring from Belgium to Reykjavik and installed by the team in the Saga Hotel. The special call TF3D was allocated by the local telecom. . . . *TF3D.* TM6T was a special callsign at F6KBF (radio club of Maisons-Laffitte near Paris) for the WPX and for the 25th anniversary of the club. . . . *TM6T.* It came down to a three-band contest here. At least the snow static wasn't too bad. . . . *VC3SK.* We were all burned

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220-225	KP-1/220	KP-2/220
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CIRCLE 136 ON READER SERVICE CARD

by the Caribbean sun during antenna installation. Bloody hurricane destroyed all antennas here! But this was first ever True Russian Contest expedition! So we found it enjoyable. See you all next contest from some exotic place. 161! Andy, Vadim, Alex, and Mike. . . . *VP2E*. We are extremely grateful to our host, TA3B, and the entire Izmir ham community for their hospitality, support, and encouragement. They made this contest a truly unique experience. . . . *YM3DL*. The antenna system failed in 20, 15, 10, 80 and 160 meters. The shack AC power breaks down on Sunday in the morning. . . . *YV3IUP*. Murphy reared his ugly head and wreaked havoc throughout the weekend. . . . *KP4XS*.

Station Operators Multi-Op Single Transmitter

4G1A: DU1COP, 4F1FZ, 4F1DMD, 4F3GDX, DU3MJJ, DU1JQV, DU1QJW, 4F1FZE, Lito, Amang. **9A7A**: 9A2ME, 9A3ER, 9A3TR, 9A4PA, 9A4RX, 9A8AA, 9A3QA. **AA2VN**: AA2VN & AA2OT. **AC5CT**: AC5CT & N3BUO. **BY2HIT**: Club Group. **CH6FI**: VE6LB, VE6PY, VE6NA, VE6AQ. **CQ3B**: CT3EE & CT3HF. **CSØRCL**: CT1ASU, CT1DSH, CT1ERY, CT1EWX, CT1FNT. **CS4ZF**: CT1EIF & CT1EAT. **CT8T**: CT1AOZ, CT1CLR, CT1DVV, CT1ESV. **CY2A**: VA3ZC & VE2ZP. **DAØXX**: DL7UZO & DL7UVO. **DFØRG**: DG2ABP, DG6OBX, DL4OCL, DL6OBX, KF4HQI, KF4HQJ. **DF7RX**: DF7RX, DK2OY, DL1MGB, DL4RDJ. **DJ6QT**: DJ6QT, DL1VJ, DL3KDV. **DK4QT**: DK3DM & DK4QT. **DLØSKZ**: DL1AQU, DL1AQV, DL1AZZ, DL3ARK, DL3ASK, DL3ATK, DGØOGF, DE1SLZ. **DLØUM**: DF8WS, DK7ZH, DK5OZ, LX1NO. **DL3KZA**: DL3KZA & DL1KZA.

DL3QQ: DL2VB, DL4YBZ, DL6YFB. **DX3H**: 4F3AAL, 4F3CW, 4F3OM, 4F3CWX, 4F3HS, DU3FBB, DU3ZNN, DU3NCM, DU3CWM, DU3RF, DU3CWG, DU3OHM, DU3CWE, DU3CWN, DY3DRY, DU3RIG, DY3DRV, DU3GOL, DU3CWD, Jojo, Trevor, Manny. **E22AAB**: HS1CHB, E21ENF, HSØLLA, E21EMJ, HS2AYX, HSØ/G3NOM, E21UHL, HS7IKF, HS1MXM, HS3II, HS5MB, E21MIS. **EA1URG**: EA1BCK, EA1FDD, EA1DDU, EA1ABM, EA1BXM, EA1HL, EA1KR. **EA3ATM**: EA3ATM, EA3FQV, EA3GJH, EC3CIL. **EA3BT**: EA3BT & EA3AOK. **EA3CWK**: EA3CWK, EA3AJW, EA3ADW, EA3GGO. **EA3RKG**: EA3BOW, EA3BOX, EA3DGQ, EA3EIO. **EA4RCU**: EA4AES, EA4BPJ, EA4BT, EA4COT, EC4AJL. **EA5FUF**: EA5CKP, EA5DJH, EA5EOC, EA5FUF, EA5GPP, EC5AIF. **ED1K**: EA1ABT, EA1YO, EA1EK, EA1FD, EA1AGP, EA1AHY, EA1BD, EA1EB. **ED2WP**: EA2ATU, EA2CCG, EA2MQ.

ED3DX: EA3AVP, EA3AET, EA3AFR, EA3AMK, EA3AML, EA3AVH. **ED5WPX**: EA5KY, EA5ZI, EA5ABE, EC5AEB, EA-1283URE. **EU5F**: EU6DX & EW6MM. **EX9A**: EX2M & EX7MM. **FK5DX**: FK8GM & FK8HC. **GW3CSA**: GØKXL, G3RTU, GØSTU, GØPZO, GØIEQ, G4WSE, G1AOF, GØDBE. **GW8GT**: GW4JBQ, GW6ZUQ, GW3NWS, GW3KYA, GW5NF, GWØMAW, GWØPK2ZJJ, IK2SGF, I2GXS. **II3R**: IV3TMV, IV3NVN, IV3ARJ, IV3VBM, IV3JVJ, IV3IRX. **IK4ZIT**: IK4ZIT & IK4QJH. **IK7EZP**: IK7EZP, IK7DXP, IK7JWX. **IO2L**: I2OKW, IK2SFZ, IK2ECM, IK2YYE, IK2YXP, IK2IQD, IK2HAJ. **IO5A**: I5JHW, I5NSR, I5OYY, IK5EKB, IK5JAN. **IQ4T**: I4DZ, I4MNY, IK4HVR, IK4SXJ, I4IFL, IK4NQK. **IQ7A**: IK7MCJ, IK7QLZ, IK7XIV. **IQ9K**: IT9KWF, IT9EWG, IT9VDQ, IW9EIN, IW9EKK. **IR4T**: I4UFH, I4JMY, IK4IEE, I4YSS, IK2QEI, IK2SGC.

IT9AJP: IT9AJP, IT9CML, IT9INO, IT9YHR. **IU1L**: IK1RLI, IK1NLZ, IK1XVK. **IU2D**: IK2IKT, IK2FEO, I2TZK, IK2EKY, IK2UWA, IK2YQX. **IU9C**: IT9HLC, IT9JOF, IT9THD, IT9ZAG. **JA1YXP**: JM1UWB, 7K1EWD, 7L1ETO, 7N1WIY, JL2FJA. **JE6ZIH**: JR6GKT, JF6DEA, JG4KEZ, JI6BRB. **JG2ZQZ**: JA2BY, JA2BIV, JA2JSF, JH2UVL, JE2HCJ. **JT1JA**: JT1CO & JT1BV. **K1KP**: K1KP, K1JKS, W1FJ, N1OEK, WA1S, KA1FMR. **K3MD**: K3MD, N3PUR, N3NWN. **K5XI**: KC5AMA, KC5OFE, KK5GJ, KJ5IP, K5ZTY, WD5DXL, WA5DWX, WA1YIA, WA5POK, KB5YVT, NET. **K6GSS/AH7**: K6GSS, WH6CTO, WH6CYX. **KB2HZ**: KB2HZ, KE2JR, NV2W, WA2VUN. **KB3TS/NH6**: KB3TS & N3KEG. **KC1F**: KC1F & N1AU. **KC5I**: KC5I & KA5GJU. **KC5RMW**: K7UP & KN5H. **KC7V**: KC7V & AA7NO. **KF9PL**: KF9PL, NO9Z, W9SZ, N4OGW/9. **KI1G**: KI1G, K1NG, NB1U.

KI7WX: N5CT, KI7WX, K6XO. **KMØR**: KMØR & ABØAO. **KQ4HC**: KQ4HC & KO4EW. **KRØB**: NØBKL, KSØT, KJØB, KBØKQA, KRØB, AF9T, KAØJZV. **KR4ND**: KR4ND, KE4KMG, KD4BAM. **KT8X**: AA8U, AA8AV, K8MJZ, AA8FE, KF8DF, KF8QE, KB8ECG, KG8CO, NU8Z. **KZ6X**: K6ZX, N6KI, KF6BL, KM6XA, KM6SN, WB6NBU, N6UZH. **LA1H**: LA2MV & LA9AU. **LA1VFA**: Club Group. **LU1HPW**: LU2HJA, LU3HPK, LU1HLZ. **LU1NF**: LU8NAR & LU1NDC. **LU1UM**: LU3UAT, LU8UAR. **LU4AA**: LU2BDG, LU6BEG, LU8AQE. **LU4DRC**: LU3EUO, LW1EXU, LW4DWN, LW5EFC, LW6EFP, LW9EFE. **LU8DZE**: LU6DH, LU6DTS, LU1EEG, LW7EIC, LW9ETY, LW4DYU, LU6VOQ, LW5EDJ. **N5OZB**: N5OZB, KJ5SU, KC5DOT, KC5ZRD. **NCØP**: WOØV, WBØGVY, WRØG, NCØP, NØSM, WAØFLS. **NE2W**: AA2EDQ, AA2MU, KC2FY, N2HR, NK2H, WE2K, N2MSB, N3VKN, NE2W.

NE3F: NT3V, N3JLL, AA3AO, NE3F. **NE8T**: NE8T, N8BTU, AA8UG, AA8UH, N8CXX, K8CC. **NV7J**: NV7J, AA7XX, K7OSK, WA7FOE. **NX3Y**: NX3Y, KA3QLF, AA3JD, AA3EZ, WA3NVS, N3ASU, N3MLV, N3MUV, AG3M. **OEM2S**: OE1ETA, OE2MON, OE2VEL. **OH1AA**: OH1KAG, OH1LEG, OH1MYA. **OH1EH**: OH1EH & OH1MDR. **OH2IW**: OH1JT & OH2IW. **OH2NRG**: OH2LRE, OH2KHX, OH2KMT. **OI1AB**: OH1-1ØØ, OH1-2ØØ, OH1-555. **OI1W**: OH1NOA, OH1NSJ, OH1XT. **OI8LQ**: OH8LQ, OH8MCT, OH8MOX. **OK1KZD**: OK1TO, OK1HWB, OK1VCB, OK1UQS, OK1JEF. **OK2KOD**: OK2BDI, OK2BGR, OK2BHM, OK2PID, OK2WAZ. **OK7DX**: OK2PHH, OK2BXN, OK8IKE,. **OL2A**: OK2DPK & OK2HBY. **OL5T**: OK1NR, OK1TC, OK1DNR, OK1DXF, OK1HSK, OK1MUJ, OK1FXX. **OM3A**: OM7ZZ, OM8AW, OMØWR, OM3KHU: OM3-ØØØ1, OM3WFD, OM3JS.

OM3RDP: OM3CDZ, OM6ACM, OM6ACW, OM3-ØØ5Ø. **OM7M**: OM3PA, OM6KW, OM3TPF, OM5ZW. **ON5LL**: ON6ZX, ON6MP, ON6NL, ON4AEK, ON4AKL, ON4AHF, ON4BR. **ON6BR**: ON4AYL, ON6JN, ON6ZR. **OT6R**: ON4BCM, ON4BBV, ON6MN, ON5KK, ON5UE, ON7DQ, ON4TT, ON7KK, ON6PV, ON4NG. **OZ5BAL/P**: OZ2ELA, OZ1CHL, OZ1JSH, OZ1GER, OZ1HDF. **OZ5EDR**: OZ1IVA, OZ5ABD, OZ5LH, OZ6VG, OZ7AAQ. **PI4CC**: PA3BSQ, PA3EPD, PBØAIU. **R3ARES**: Club Group. **RK3QWM**: Sergey & Al. **RK9CWW**: UA9FQY, RA9CMO, S. Rusakov. **RK9CWY**: RX9CAZ, RA9CJR, Tovapova. **RK9FZW**: RA9FR & RA9FRD. **RU1A**: RV1AW & RW1AC. **RU3A**: RA3AUM, RK3DT, RV3AAE, RV6HY, RVØAU, RX3ACS, RX3ARI, RX3ANX, RX3DCX & Old Alex. **RU4L**: UA4LL, UA4-164-528, UA4CVR/4. **RU6LWZ**: UA6LO, UA6LV, UR5MVZ, RV6AJJ, RV6LMG, RV6LOB.

RW2F: RA2FA, UA2FF, UA2FB, UA2FX, UA2FZ, UA2FBA. **RW9OWD**: RA9OW, UA9OOR, UA9OOX, UA9OOA. **RX3RXX**: UA3Ø157-611, RA3RFA, RU3RM, UA3RFC. **S57CM**: P6TPF, SP6OJG, SP-23Ø22-OP. **SP9PRO**: SP9ERV, SP9LJD, SP9EWO, SP9-3Ø21. **TA2II**: TA2II, Z32ZM, TA2IK, TA2CIQ, TA2CMM, TA2CKD. **TF3D**: ON5OO, ON7PC, ON6QR, ON4KHG, ON4LAI, ON1KSZ. **TK1A**: TK5EP & TK5NN. **TMØPX**: F5BSB, F5BRW, F5BZB. **TM1C**: F6ARC, F6FVY, F5MZN, F5VCO, F6CTT. **TM2X**: F2VX, F5OZF, F5RXL, F5SSB, F6EXV, EA2KL. **TM5Z**: F5RNY, F5PTM, F5NGZ, F5LEN. **TM6T**: F5RAV, F5RRX, F5RWM, F5HQY. **TM8FL**: DL2EBX, DL9ZH, DL4FF, DL7PD, DL4FS, DL9FCK, F5ITU, F5TRV, F1SJ, F1SEQ, F5PMT, F6DQX. **TO5T**: FM5BH, FM5DN, FM5DP, FM5DS, FM5EB, FM5GU. **TP1ØCE**: F6FQK, F5JFU, F5SIH, F5PFP, F5PXT. **UR4E**: UR5ECW & UR5EDX. **UT7L**: UA9FQY, RA9CMO, S. Rusakov.

VC3SK: VA3SK & VA3WTO. **VD6AO**: VE6MZ, VE6EPK, VE6NAO, VE6TFM, VE6KKR, VE6HFW, VE6KC, VE6NJK, VE6JO, VE6CIZ, VE6RAJ, VE6JAZ. **VE3RM**: VE3RM, VE3WIB, VE3WRL. **VE5SF**: VE5SF & VE5CPU. **VE6SV**: VE6SV, VE6WQ, VO1CV. **VK1DX**: Club Group. **VK4MZ**: VK4MZ & VK4EMM. **VK6ANC**: VK6APK, VK6NU, VK6ATA, VK6EH, VK6FJA, VK6TKR, VK6ZDW, VK6CR. **VP2E**: UA3DPX, RA9JX, RX9JM, RZ9UA. **VS6WO**: 9V1YC, VS6WO, VR2GO. **VU2PAI**: VU2PAI & VU2OXX. **W1BK**: W1BK, WA1UAR, K1TXH. **W5KFT**: AA5RB, W5KFT, WB5VZL, DF4FD. **WA6TKV**: WA6TKV & KD6KKP. **WA7IIM**: Club Group. **WE9V**: WE9V, KS9K, NØBSH, WX9E. **WG1N**: WG1N, K6XC, W6ORD, W6EEN. **WP4U**: WP4U, UR5LAW, UX3QA, EW1WZ, EW1AR & Victor (ex-UH8EA). **WU7Q**: WAØIVL & W6REC. **WY3T**: N3JRX, N3KGL, N3DSR, KA3PVA, N3VMT, WA3MFT, WI3L, N3NQS, WY3T.

XR8S: XQ8ABF & CE8SFG. **YBØZCE**: YBØUJK, YCØCVV, YCØFTD, YCØJBE, YCØLCF, YCØPIB, YCØYTL. **YFØANK**, YFØBXX, YDØBDA, YDØPGD, YDØLBK. **YM3DL**: DL3FDU, DL4VBP, DL8OBC. **YO2KJO**: YO2LGU & YO2LIF. **YO5KAW/P**: YO5CYG, YO5OCP, YO5CMT. **YT7P**: Sale, Alex, Srki, Zoran. **YU1L**: YU1OO, YU1JZ, YU1GD, YT1EPG, YT1FAV, YU1ML. **YV3IUP**: YV3EDO, YV3APN, YV3EMO, YV1ACQ. **YZ7A**: YU7CM, YU7KC, 4N7CC, 4N7ZZ, Pala, Juhem, Norby, Lacy, Laci, Levi, Bob, Sepe, Gaby, Tamy, Getg, Atila, Andor, Bandi, Tomi. **ZXØF**: PY5EG, N5FA, PY5CC, PY5GU, PYØFF, PY5GA, PU5OMS. **ZZ5E**: PP5ZYZ, PP5WG, PP5JD, PP5TM, PU5ANB.

Station Operators Multi-Op Multi-Transmitter

9A1A: 9A9A, 9A5W, 9A2DQ, 9A3GW, 9A2B, 9A2EU, 9A2R, 9A2TS, 9A3NR, 9A6A, 9A6D, 9A7R, 9A9AA, S51D, S51R. **AB4JI**: AB4JI, AD4Y, K4ADK, KS4LU, KO4BT, K4CEF, KA2DRH, KO4LC, N4DUG, N4WBS, N4PYD, N4OYP, WA4DPU, KU4J. **CK7PG**: VE6PDQ, VE7CV, VE7DBS, VE7EAP, VE7EME, VE7PTT, VE7RBL, VE7SK, VE7TCP, VE7VX. **EA3FP**: EA3AAY, EA3AJM, EA3CCN, EA3CKX, EA3CUQ, EA3CWU, EA3EJI, EA3ESJ, EA3EZD, EA3FB, EA3UJ. **ED7WPX**: EA7BJV, EA7ESH, EC7ADD, EC7AHN. **EM2I**: UT2IA, UT2ID, UT2II, UT2IJ, UT2IM, UT2IO, UT2IS, UT2IV, UT2IW, UT2IY, US2IR. **JO1YAO**: JA1PEJ, JH1AZO, JM1NKT. **KF9YT**: KF9YT & N9VVV. **KP4XS**: KP4XS, KF3P, AA6KX, S55OO, K3JT, WD8ISK, ND3F. **LY7A**: LY1DF, LY1EE, LY2BMX, LY2BUE, LY2KZ, LY2NK, LY2UF, LY3DA, LY3NMW, LY4AA, LY4AF, LYB 26, LYR 346, A. Toleikis, D. Jasiulis.

OT6A: DL3JE, DL3EBM, OM2TW, ON1AEI, ON1AFF, ON1AWB, ON1CIM, ON1DAL, ON1DEK, ON1DEU, ON1GL, ON1GN, ON2AIM, ON2BDD, ON4AID, ON4AJW, ON4ALL, ON4AMX, ON4ASB, ON4AUC, ON4AWH, ON4AWU, ON4AWV, ON4BAG, ON4BBL, ON4BI, ON4CDC, ON4CDE, ON4DB, ON4FG, ON4FI, ON4MA, ON4SU, ON5CD, ON5DH, ON5GO, ON5OT, ON5UM, ON6HP, ON6HZ, ON6OW, ON6PU, ON7AW, ON7DR, ON7HU, ON7NB, ON7SF, ON7VU, ON7YZ, Jeannine. **PA6WPX**: PA3BBP, PA3BUD, PA3BWD, PA3ERC, PA3EWP, PA3FQA, PA3GBQ, PA3GXF, PBØAIC, UT4UZ, PA3DMH. **SV1DKR**: SV1DCR & SV1DKD. **VD5RI**: VE5FD, VE5FF, VE5FN, VE5WI, VE6BBP, VE6BDP, VE6EZ, VE6SYM, VE7AV. **VD6JY**: VE6JY, VE6FR, VE6SLV, VE6EX, VE6LDX, VE6DGG, VE6LCB, VE6BF, VE6NWG, VE6JAG, VE5MX. **WM2C**: WM2C, N6RO, K3EST, N4TQO, N6IP. **WT1S**: WT1S, NX1H, K1FWE, K1BG. **WZ1R**: WZ1R, KY1H, WM1K, AA1AA, KM1P, NE1V, NJ1F, WR2I, WA1ZAM, KE6BER. **YO8KUB**: YO8SEG, YO8RSL, YO8RTR, YO8SAL.

(Scores on page 104)

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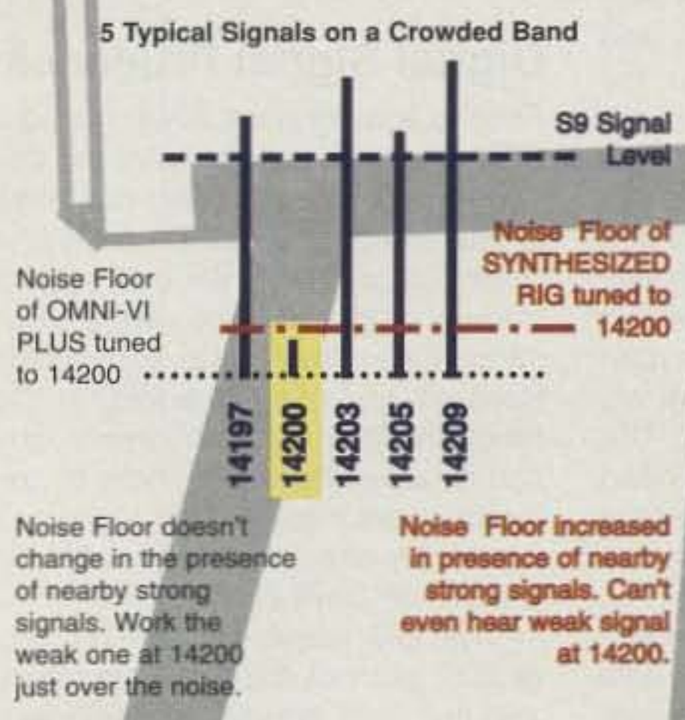
WORK STATIONS OTHER RIGS CAN'T EVEN HEAR

Let's compare OMNI to any competitor's synthesized rig with both tuned to the same frequency.



Phase noise generated *inside* the competitor's rig causes the noise floor to *temporarily* increase, covering weak signals *inside* your passband, especially when strong signals *outside* your passband are within a few KHz of where you'd like to listen. No other transceiver comes close. With this masterpiece in your shack, you'll work stations missed by others.

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ATTENTION TO THE DETAILS

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THE FINISHING TOUCHES

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The Kenwood TS-570D HF Transceiver

BY DOUG DeMAW*, W1FB

The task of describing a new state-of-the-art HF-band transceiver in a few magazine pages is not an easy one. The TS-570D (570D, hereafter) has so many innovative and useful features that I could write a book about the transceiver and still overlook some interesting attributes. Having owned and operated Kenwood TS-140S and TS-450S transceivers before receiving Kenwood's latest offering, I needed to change my approach to operating because the 570D is essentially menu-driven. This feature should present only a minor challenge for those who are familiar with computers. Amateurs who aren't "computer savvy" should have no difficulty programming the transceiver via the menu system it contains.

The operating manual explains the steps one must follow when setting up the 570D for routine operation. It required only two hours for me to make the change from traditional knob and switch adjustments to utilizing the faster and more positive menu system. The TS-570D has only six panel knobs. Three of them are concentric controls that have dual functions. A keypad and a host of pushbuttons grace the front panel for controlling most of the functions.

I was pleased to find that the 570D is supplied with a built-in automatic antenna tuner that operates from 160 through 10 meters. The built-in DSP (digital signal processor) is another bonus feature. It operates at audio frequency and is in the circuit at all times. A concentric panel control allows the operator to shape the receive audio for the desired high- and low-frequency response (slope). It can be used also, via menu programming, to shape the transmitted audio, and for establishing the desired CW selectivity on receive. More on this later.

TS-570D Main Features

Gone is the older type of LED readout display. The 570D has an easy-to-read LCD display with large black letters on a beige background. Illumination of the display can easily be changed to suit the operator's eyes. The frequency readout numbers are 1/2 inch high and can be read from across my radio room.

Transceiver output power can be displayed at the push of a button. It is adjustable in 5 watt increments from 5 to 100 watts. This is a useful feature for QRP operation and for ensuring that a linear amplifier is not driven with more power than it can accommodate safely. I keep the power level at 70 watts for my amplifier.

The speech processor compression level can also be set from the front panel. It is adjustable in increments from 0 to 25 dB in 5 dB steps. I was pleased to learn from several on-the-air friends who know my voice characteristics that the processed audio did not exhibit the distortion caused by some transceivers at high compression levels. When set at 5 and 10 dB of compression (sans shaping with the DSP filter) levels they reported no significant change in speech quality, even though their S-meters showed a higher average signal-power level. However, at 20 and 25 dB of compression they reported hearing the amplifier fan noise and other sounds from within the house. Also, my voice sounded a bit harsh and unnatural. I usually operate with 5 dB of compression, just to give the signal a little "presence."

Front view of the Kenwood TS-570D HF transceiver.

CW operators will appreciate the **CW Tune** feature. If the station being worked is slightly off the established operating frequency (within beat-note audible range), the operator can push the **CW Tune** button and the system will seek the correct pitch and lock on it. The desired pitch can be preset. There is no need to use the RIT in such instances. The transmit frequency changes accordingly.

There are 46 menu selections in the 570D. A scrolling digital sub-display indicates which menu is selected, along with its purpose. The manual clearly describes how to set the parameters for each menu selection.

A bank of 100 memories is available. Ninety of these are available for standard frequency storing. The remaining 10 are used for programmable VFO, programmable scan, and long-term memory functions.

There are also five **Quick Memory** channels in the 570D. These are used for what Kenwood calls "on the fly" operation during current operation. This feature is especially useful when keeping tabs on DX pile-up frequencies while operating on a different frequency or band. It is a time saver over using the standard memory channels, into which the operator does not want to program frequencies of temporary interest. I use the **Quick Memory** for instant monitoring of other frequencies (nets, etc.) for which I have a passing interest.

Digital Signal Processing

Prior to acquiring the 570D I used an outboard DSP filter. It is a joy to have the DSP filter built into the transceiver. This has eliminated a lot of unwanted cable clutter, while providing more desk space. The DSP operates at audio frequency and has wide-range possibilities for eliminating interference, along with shaping the transmit and receive audio. In the bandpass mode the filter high- and low-frequency slopes can be adjusted to eliminate or greatly reduce interference from nearby signals. This can be especially effective when used in combination with the **IF Shift** control.

The **BC** (beat cancel) button, when engaged, permits the DSP circuit to hunt down and null beat notes from multiple carriers that may be present at a given time. Extremely deep nulling was noted during my tests. However, when in the BC mode the null depth changes when a strong desired signal appears on frequency. The heterodyne can be heard at this time, but with far less amplitude than with the BC disengaged. The null becomes deep again when the loud received signal ceases. Also, with the BC engaged the received signal tends to sound fluttery (somewhat like voice signals

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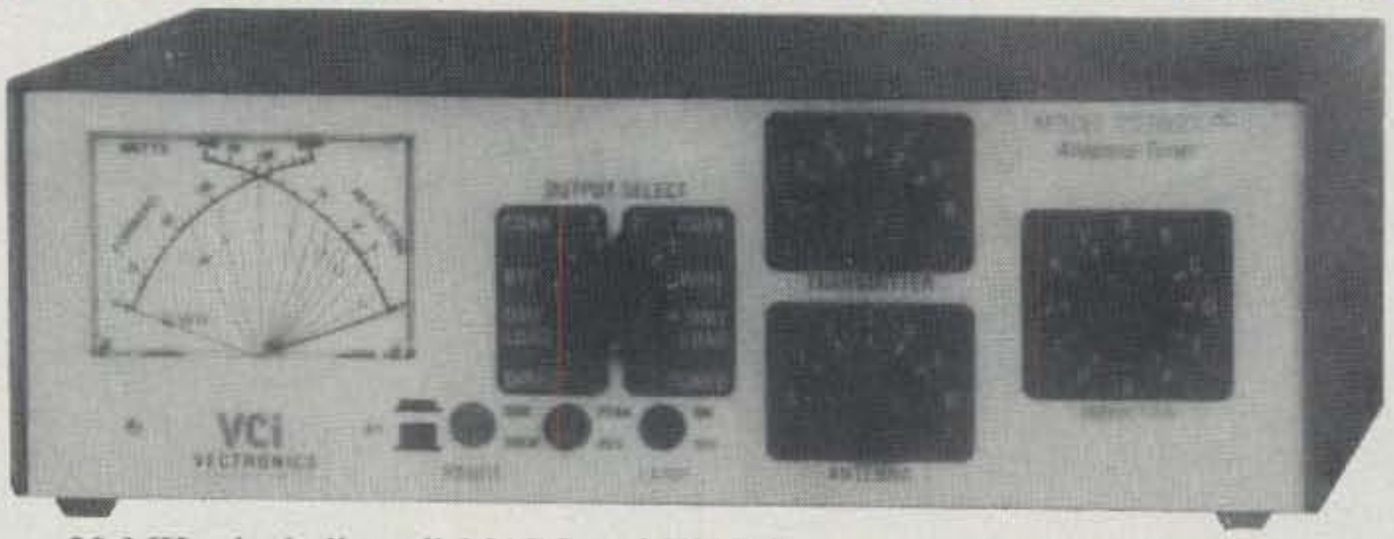

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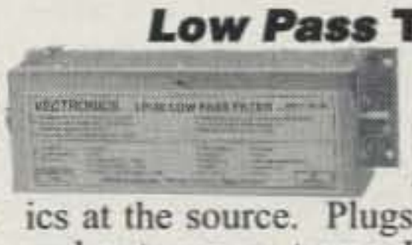

LP-30, $69.95. Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1500 watts.

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HPF-2, $24.95. Installs between VCR/TV and cable TV or antenna lead-in cable. Eliminates or reduces interference caused by nearby HF transmitters.

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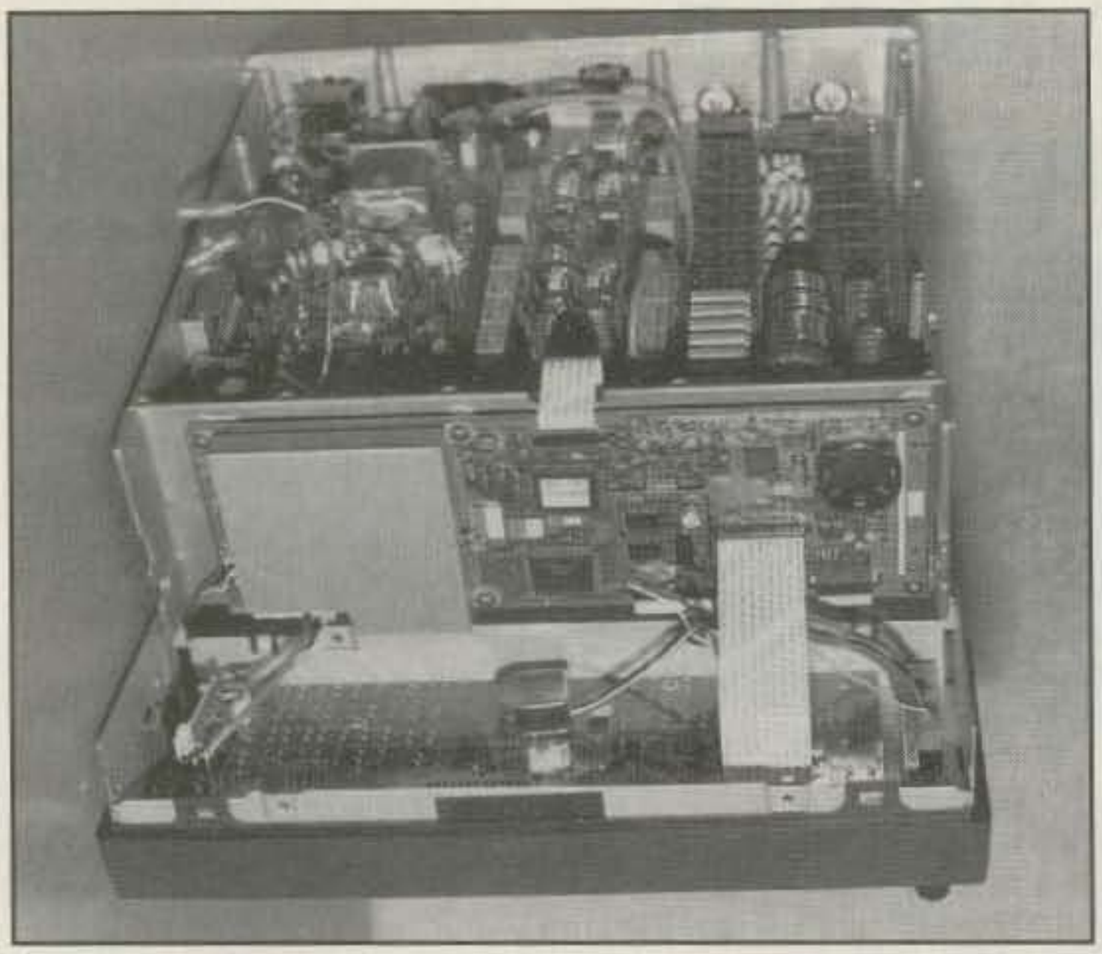
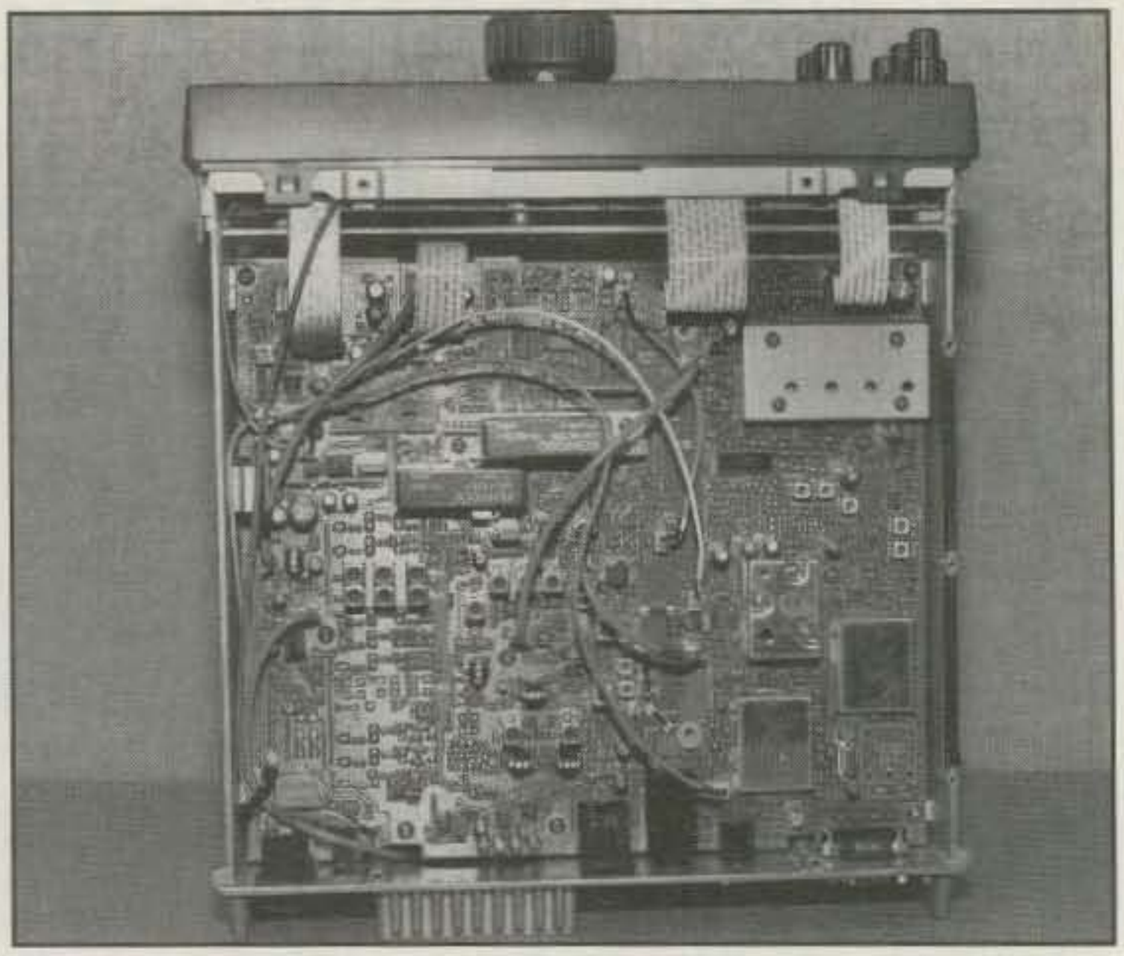


The front panel folds down for easy access.



The interior view shows fine quality workmanship throughout.

sound during mild auroral conditions). Getting rid of annoying heterodynes is well worth this small tradeoff.

Still another function of the DSP circuit is the **NR** (noise reduction) option. The effects are incredible! Although the 570D has a standard noise blanker, it operates on a different principle than the DSP NR circuit. The standard blanker is effective for eliminating manmade pulse noise, but the **NR** function acts on all types of noise. **N.R. 1** is used for SSB reception and **N.R. 2** is for CW reception. I have tuned in weak SSB signals that were only Q2 or Q3 because of band noise. By engaging N.R. 1 these signals became Q5 and the band noise dropped markedly. The noise could still be seen at the previous level on the S-meter, but it could not be heard at the receiver output. Again, there is a tradeoff one must accept: The voice signals take on a "hollow" sound with restricted fidelity, but they are perfectly readable. Also, when the NR is engaged one can hear a subliminal sound that resembles a waterfall (for lack of a better description). Several 570D owners to whom I have spoken are hearing the same sound with the NR activated. It in no way impairs reception. I've become used to it.

When in the CW operating mode the DSP filter can be programmed for bandwidths as narrow as 50 Hz. The center frequency is tied to the chosen pitch frequency so that they track together. I have my bandwidth set at 200 Hz. I use the YK-88CN-1 accessory 270 Hz CW IF filter in my 570D. This, in combination with the DSP filter, provides exceptional CW reception. I have found weak DX CW signals that could be heard only with the DSP filter engaged (N.R. 2 mode). Going from not hearing a weak signal to being able to copy it Q5 is nothing short of remarkable! The YK-88SN-1 accessory 1.8 kHz SSB filter can be installed in place of the narrow CW filter for when the going gets rough during voice operation. It can help to minimize QRM from adjacent frequency SSB signals.

Audio shaping for speech transmissions may also be accomplished with the DSP filter. This feature can be used to compensate for the characteristics of microphones and the operator's voice. There are four settings for SSB, AM, and FM. Available are high boost, bass boost, formant pass (to minimize external sounds), and conventional mode for obtaining an "analog" sound. The operator may elect to utilize the speech processor and the DSP transmit audio equalizer to create the precise voice effect desired. The manual contains an in-depth explanation of the DSP circuit and how to use it.

Receiver Highlights

The 570D receiver may be tuned continuously from 500 kHz through 30 MHz. Fast or slow tuning rates may be selected at the front panel. There are two preamps. One is for high-band (21.5 MHz and higher) operation; the other is for low-band service (1.8 to 21.5 MHz). The preamps can be switched out of the circuit for increased receiver dynamic range. A 20 dB front-end attenuator is also available for this purpose.

The main tuning knob provides various degrees of frequency change for 360 degrees of main-tuning knob rotation. In the encoder **F** step there is 10 kHz of frequency change for the 100, 500, and 1000 (default) steps. In the **Fine** step mode there is 1 kHz of frequency change per revolution for the 10 and 1 Hz modes. **RIT** and **XIT** are available for changing frequency, too. Frequency change is 100 Hz per knob revolution in the **Fine** mode. Both functions allow 10 kHz of frequency change above or below the operating frequency. This wide range is useful for some types of split operation. The dual VFOs (**A** and **B**) are commonly used for split operation.

The squelch control is usable in the AM, FM, and SSB modes. The metering functions are displayed with curved analog-style meter scales, but the readout blocks are digital. I found the S-meter calibration to be realistic (not Scotch or liberal). A 50 µV signal yielded a near S9 meter reading on most of the bands.

From a subjective point of view, the receiver audio quality is excellent. I use an external 5 inch midrange speaker. The fidelity is good, and signals do not sound distorted at high **AF Gain** settings. Kenwood can supply its SP-23 accessory speaker to those who prefer a matching unit. There is no discernible receiver white noise present when an antenna is connected to the unit. I found no spurious responses (birdies) in the receiver tuning range—another plus.

CW messages are heard when some of the functions are changed, an asset for those who are blind. A blind colleague of mine (KE8BW) informed me that there is a voice synthesizer (VS-3) available for the 570D. It "talks" all of the transceiver functions and digital display information when operating changes are made.

The two-tone receiver dynamic range (preamp on) checks out at 98 dB at 14.1 MHz with a CW bandwidth of 500 Hz at 20 kHz frequency separation. The minimum discernible signal (MDS) is –136 dBm (preamp on). The intercept point is +32.7 dBm under the foregoing test conditions.

Transmitter Features

The transmitter carrier output power is dropped automatically to 25 maximum watts in the AM mode. However, 100 watts of peak output power is provided for 100% modulation. I find AM mode (sans modulation) useful for tuning my Transmatch and linear amplifier at low power. AM output power is adjustable down to 5 watts.

The 570D contains a built-in iambic keyer that can be used with a paddle, bug, straight key, or keyboard keyer. There are three CW memory channels. Each can store 50 characters. The keyer can repeatedly play back the message, or it can be interrupted upon key closure. The menu system allows these functions to take place. QSK or full break-in operation is available with the 570D. Keying speed and weighting can be changed via the menu system. Auto-weighting may be chosen to allow the keyer to self-adjust to the keying speed.

Microphone gain is presettable with the menu system. There are two antenna inputs. Antenna 1 or 2 is selectable from the front panel. This feature is especially handy for quick band changes when separate antennas are used. It is a great operating aid also for switch-

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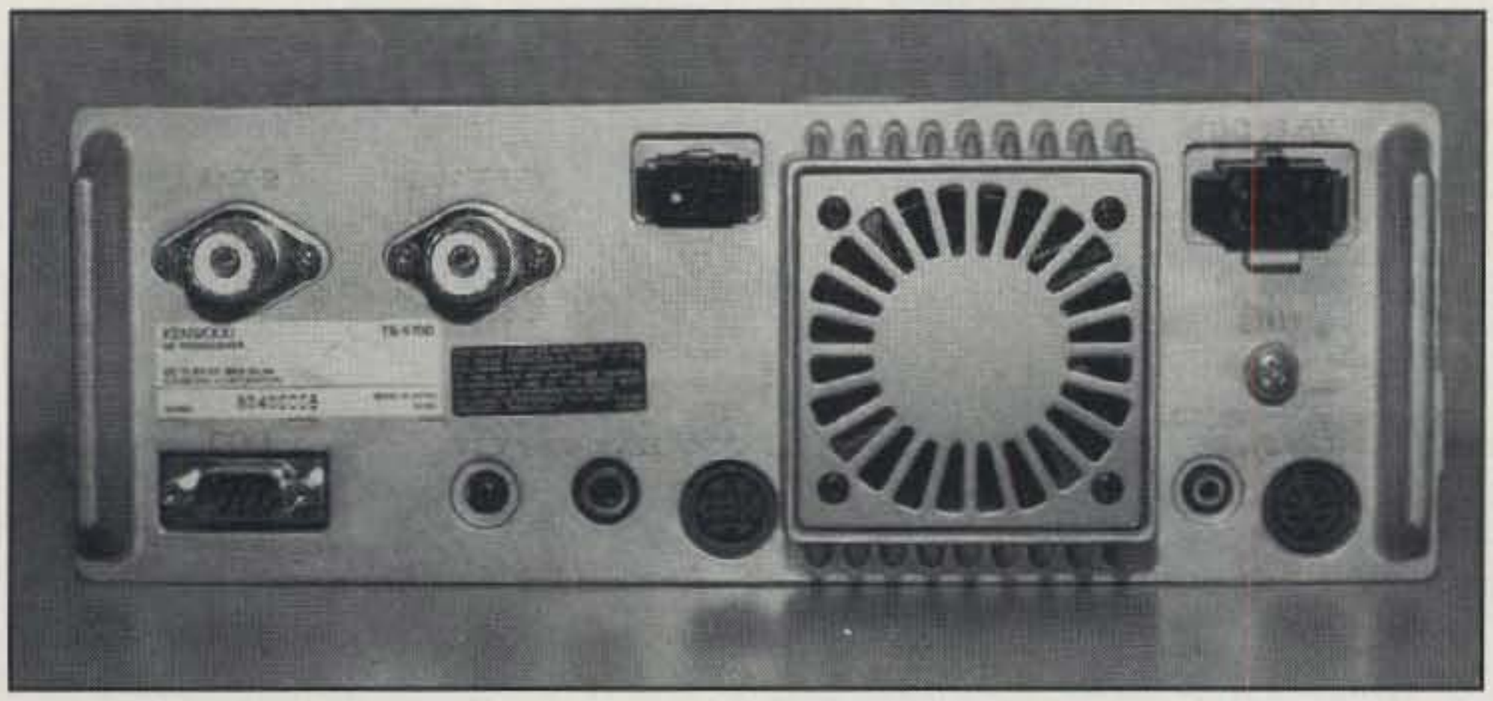

The rear view shows the connectors well spaced for easy interconnection.

ing from a transmit antenna to a 50 ohm Beverage or loop antenna during receive. All spurious output responses are 50 dB or greater below peak power. With this transceiver harmonic-related TVI should never be a problem.

The two-tone IMD measurements at 14 MHz indicate that the third-order products are 31.6 dB below peak power. The fifth-order products are 46 dB below peak power.

Computer Interface

The 570D can be controlled with a personal computer via a 9-pin D-SUB and the built-in RS-232C interface. All that is required is a cable between the rear panel of the transceiver and the computer serial port. The RCP-2 Radio Control Program allows the operator to program multiple radios, such as for use in a contest, when ragchewing, or when operating RTTY, with custom settings. They can be saved in the PC for future use.

Physical Attributes

The 570D is similar in size to the TS-450S. The dimensions are 3 3/4"H × 10 5/8"W × 11"D (96 × 270 × 271 mm). The weight is 15 pounds (6.8 kg). The relatively small size makes it an ideal rig for mobile and portable operation. It occupies only a modest amount of space for home use, which I find desirable. Despite its small size, the panel controls are not so crowded as to make operation difficult, and I have big hands!

The cabinet is dark gray with control labels in white and orange. Some of the pushbuttons are light gray to make them stand out against the dark-gray background. All knobs are black.

The 570D does not have a built-in power supply. The operator may use the Kenwood PS-40 switch-mode power supply, or may opt for the heavy-duty (22.5 amp) PS-53 power supply. Minimum power supply current is 20 amps for full 100 watt operation.

A mobile mounting bracket (MB-430) is available for the 570D. The MC-60A, MC-80, and MC-90 desk mics are compatible with the transceiver. I have gotten excellent audio-quality reports with a Shure 444D, as well as with a homemade electret desk mic. The mic input impedance is 600 ohms.

Closing Comments

A number of amateurs have asked if the 570D is more elaborate than the TS-450S or less elaborate than the TS-850. Indeed, it is more sophisticated than my 450S. I can't speak for the 850S, because I have never operated one. I suspect that the 570D is midway between those two models in price and features. Certainly, the inclusion of DSP, the keyer, and the antenna tuner make it well worth the $1819.95 price.

There is also a TS-570S model (which I have not tested) which features the addition of 6 meters. This version is priced at $2179.95.

The owner's manual is well written and easy to understand. There are many pages of clearly defined steps that explain how to use the menu system and other control functions.

The manufacturer is Kenwood Corp., P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5300. A TS-570D brochure is available by phoning 310-639-5300. ■

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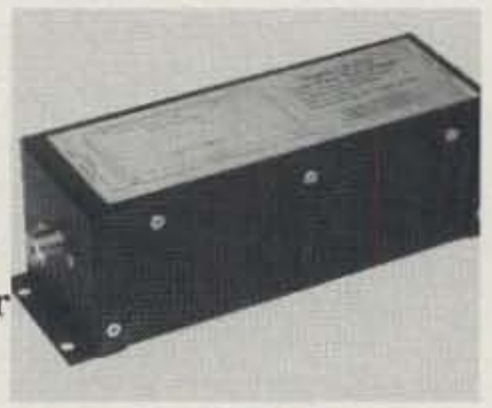

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Lew McCoy, W1ICP, and the author, W4ITD, shared some ideas on antennas, which resulted in this article. To quote Lew, "It is apparent that 160 meter antennas that are derived from quarter-wavelength wires and fed at the top of a tower are becoming more and more popular. Here is an unusual vertical—top loading, but the top is at the bottom, so to speak. With the feed and the high current point at the top of this slanter and loading at the bottom, a good radiation pattern is obtained. It is certainly worth your consideration."

The 160 Meter "Upside-Down" Antenna

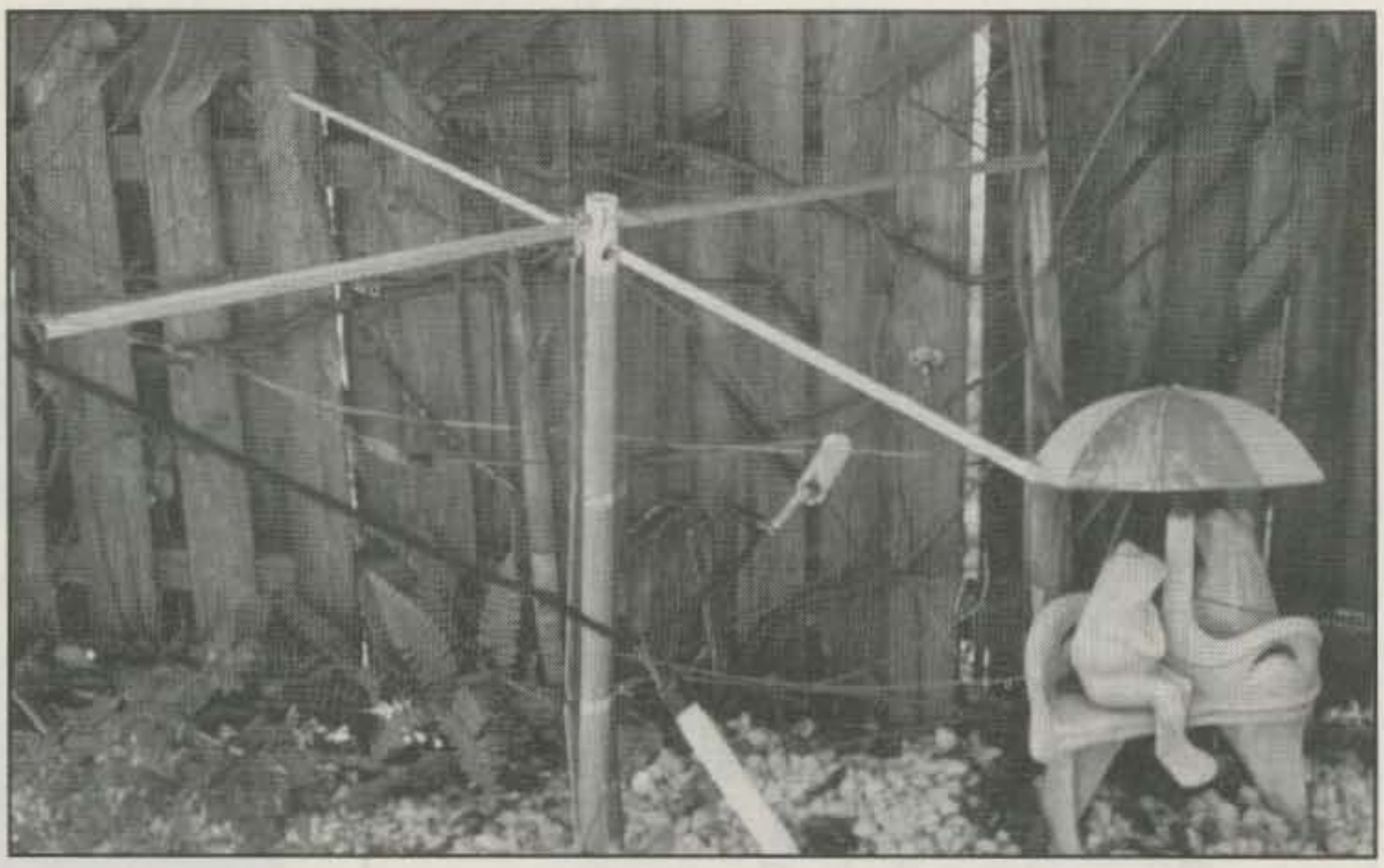
BY STEVE TABER*, W4ITD

About four years ago I built a novel approach to a top-loaded quarter-wave 160 meter antenna. I had tried several Marconi types with the feed point at the base, and a 50 foot vertical portion from which the balance of the 135 feet ran horizontally. Although they did afford contacts, they were by no means outstanding and never left me satisfied with the results.

While thinking of ways to improve my 160 meter signal, I recalled that my 75/80 meter sloper performance was vastly improved by moving the coax feed point from the bottom of the 65 foot wire to the top, at the 50 foot level. Even though the base feed was carefully done with an appropriate remote-controlled variable inductor and capacitor arrangement (which permitted its being series tuned to ground with a flat SWR), the top feed dramatically improved its performance on both local and DX contacts.

With this in mind, I reasoned that applying the top-feed principle to my 160 meter antenna would provide better results. I decided to build an inductance and capacitance hat which was sufficient to bring my 65 foot 80 meter sloper to resonance on 160 meters. The antenna books show loaded quarter-wave vertical radiators with their inductors and hats at the top and out of reach for adjusting, and they certainly would be out of reach at the top of a 50 foot tower! By placing the loading coil on the ground, I could easily change taps to bring it to resonance, after clipping the bottom end of the sloper to the coil. I have to admit this is rather unusual with "top" load at the bottom of the antenna, but it was a case of nothing ventured, nothing gained.

The capacitance hat is easily constructed by purchasing an 8 foot length of half-inch aluminum angle from the hardware store, cutting it in half, and joining the two pieces in the middle to form an "X," upon which a length of No. 12 copper wire connects four ends to form a square (see the diagram for details). Four additional lengths of wire are attached from the center of each of the four sides and run into the center, where the aluminum angles are joined, as the spokes of a wheel. This hat is mounted atop a 5 foot length of 1 inch PVC pipe which forms the support for the vertically mounted coil (to be described) and the hat above it. I had some commercial coil stock, 2 inch diameter, air wound by B & W or Air Dux which I used, but a homemade equivalent can easily be made in lieu of the commercial coil stock and will be described here also.



The top-hat section is located in the garden near the fence. The frog, obviously not part of the antenna, stands guard over the top hat. The darker line coming down from the left is the bottom of the sloper. The wire has been covered in plastic to prevent RF burns or accidental contact with the antenna.

I had three pieces of coil stock consistiong of two 10 inches long with 58 turns each, and one 7 3/4 inches long with 45 turns. I series connected these, which totaled 161 turns. When slid over the PVC support pipe, the bottom end of the inductor was 4 or 5 inches above ground. The capacity hat came to 3 feet above the ground. The inductor assembly was positioned close to the end of the 65 foot 80 meter sloper so that a short 3 foot clip lead could be connected from the bottom of the coil to the end of the sloper. I used an MFJ Antenna Analyzer to check the resonant frequency and found it to be 1830 kHz, which I had wanted.

Since many may not have the coil stock available, I removed the capacitance hat from the coil and resonated the coil with a 50 pico-Farad capacitor to ascertain its resonant frequency with my grid dipper. This turned out to

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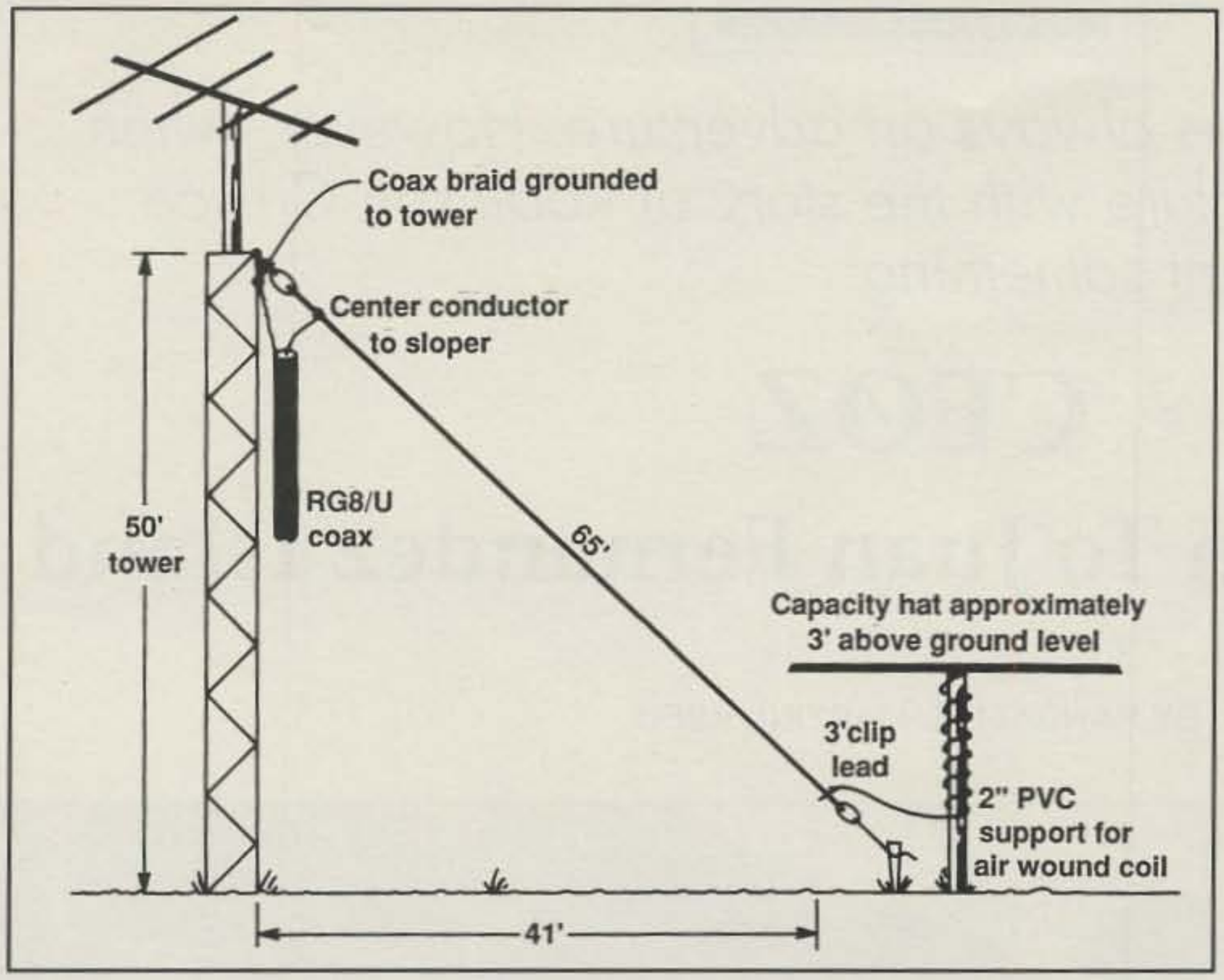

Fig. 1– This sketch shows the antenna installation. It would probably be okay to use a higher post at the antenna ground end to get the end up out of reach to prevent accidental RF burns.

More From McCoy

I was so enthused about this antenna idea that I passed it on to L. B. Cebik, W4RNL, whom I consider to be one of the smarter antenna men around today. L. B., who writes for *CQ*'s sister publication *Communciations Quarterly* on a regular basis, had this to say about the sloper:

"I think the vertical semi-sloper idea is very good in principle. Any time you can move the high current feed point of a quarter wavelength up, the antenna will perform better, and 50 feet is certainly up compared to most antennas on 80 or 160. I suspect that his far field is no longer absolutely vertically polarized. However, most of it is, and with a low radiation angle (prime for DX) and the high angle (close in), QRM, QRN, and just ambient noise are reduced. Hence, there is a better signal-to-noise ratio than with most horizontal antennas. Receivers have plenty of excess gain, so weaker rarely matters. It is the signal-to-noise ratio that is important, and an elevated feed-point vertical will do the job. ON4UN knows this, which is why he reports on the delta, fed up one leg, to produce vertical polarization almost exclusively. Total gain is not high, but the high-angle portion of the pattern disappears and the DX stands out."

L. B. Cebik, W4RNL

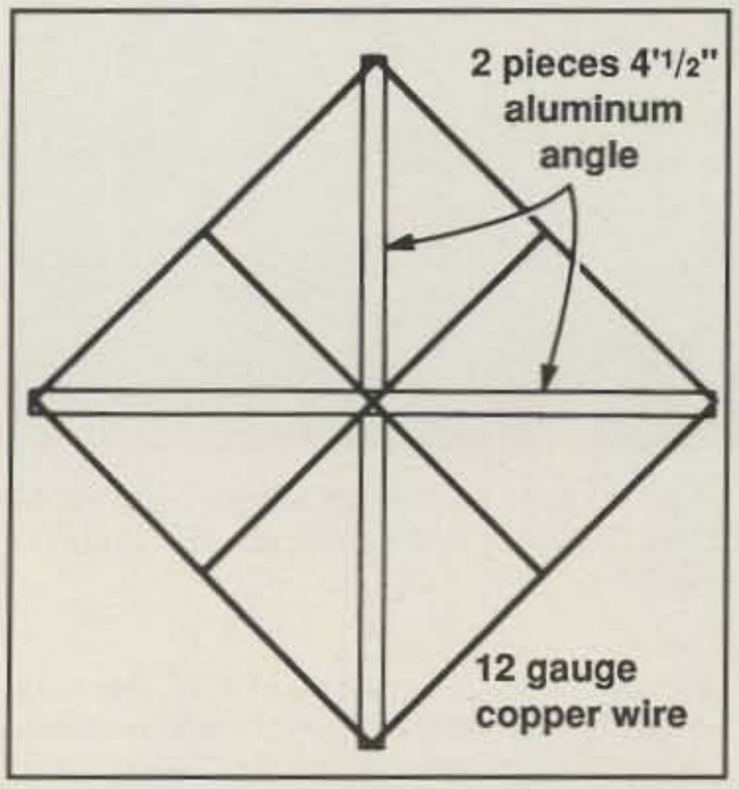

Fig. 2– The top loading hat. It is made from simple angle aluminum, some copper wire, and PVC pipe.

be 2180 kHz. With this in mind, I wound 168 turns of regular plastic-covered electrical wire type T No. 14 gauge on a 3 foot length of 2 inch PVC pipe, over a winding length of 28 inches. Both wire and pipe are available at local hardware stores. It takes about 90 feet of wire, so you might as well get 100 feet of the wire.

My tower is a Rohn 45 guyed at the 50 and 25 foot levels with insulated steel cables. A 12 foot length of aluminum mast extends above it, and a TH7DX Yagi is mounted halfway up the mast. The base of the tower is grounded with two 8 foot rods as well as several radials up to 135 feet in length running around the perimeter of my home. The base of the tower is 41 feet from the end of the sloper and loading coil. RG8 coax is used to feed the antenna. At the feed point of the antenna (up on the tower) the coax braid outer conductor is connected to the tower with a solid mechanical connection. In this case don't worry about the tower as part of the antenna. It is part of the antenna, but what with radials at the base of the tower plus a beam and who knows what else, I cannot definitely say what part of the antenna it makes. The important part is the sloper fed at the top via the coax inner conductor and then bottom loaded. How does it work? Read on.

The performance of this antenna has exceeded my best expectations. I have found this design to outperform my Marconi comparison antenna (built expressly for checking) on every test. Even though the Marconi had twice the amount of extended wire (135 feet) and used the same ground system at the same height, it never met or exceeded the other.

To see how the antenna would perform, I entered a 160 meter contest. To put the performance in perspective, first let me say I am not a contester. However, within only 4 hours of operating I worked 41 *different* states and 8 countries with my homebrew 500 watt amp.

After several months of comparing antennas and finding this design to be one to two S points over the Marconi in *all* cases, I took the latter down. I now have an antenna that performs extremely well on both 80 and 160 meters and requires only attaching or removing a small clip lead at the base of the coil to change bands. In conclusion, I have not fabricated any enclosure for rain-proofing the coils, but I have used a large plastic bag over the coil with no problem.

(Editor's Note: It would be best in the interest of safety to put a fence around the loading system. Another answer would be to use a longer [higher] post to keep the antenna ends away and to keep anyone from accidentally touching a "hot" antenna.) ■

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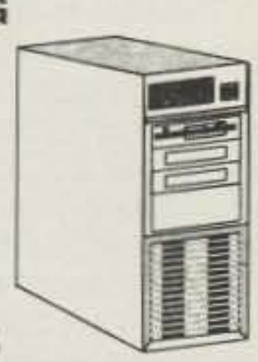

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An island DXpedition is always an adventure. However, when you couple that adventure with the story of Robinson Crusoe, then you've got yourself something.

CEØZ

A DXpedition To Juan Fernandez Island

BY RANDALL K. MARTIN*, KØEU

The 1995 DXpedition to Juan Fernandez (JF) is now but a memory. Bob Allphin, K4UEE, Bob Hamilton, KØIYF, John Torres, CEØZAM, and I spent just over seven days logging almost 18,000 QSOs. Our objective was to provide contacts on low bands, WARC bands, RTTY, and satellite while concentrating on Europe and CW. As you can see by the numbers in Table I later on in this article, we certainly accomplished our objective.

Juan Fernandez (JF), CEØZ, is not a rare country when looked at simply as an all-time new one. However, it is still a rare catch for Europeans and low-banders. There have been several DXpeditions to JF in past years, along with occasional activity from some of the locals. A DXpedition by W4QVJ in October 1963 netted 1210 QSOs.

A Bit of History

The island group was first discovered in 1574 by Spanish mariner Juan Fernandez. The islands were uninhabited at that time. Although he originally named the islands "Islas Santa Cecilia," they bear his name today. For several centuries following their discovery, the islands mainly were a refuge for pirates and sealers. Seals were exploited to the point of extinction by the early 19th century.

The islands are most famous for the adventures of a Scottish sailor, Alexander Selkirk, who requested that he be put ashore, alone, on the main island of Masatierra in 1704. Selkirk remained isolated on the island for four years, surviving on wild goats that had been left by previous inhabitants. He climbed to the top of the island nearly every day for four years, hoping to spot another vessel. Not until 1708 was he finally rescued. When Selkirk returned to Scotland, he became a celebrity and was the real-life basis for Daniel Defoe's classic novel *Robinson Crusoe.*

After Selkirk's departure the island remained a hideout for pirates until Spain re-established itself at Cumberland Bay in 1750, founding the village of San Juan Bautista. This occupation was discontinuous until 1877, when Chile established a permanent presence. In 1814 Masatierra became a prison for 42 Chilean patriots during the struggle to gain independence from Spain. In World War I, Bahia Cumberland was the site of a naval battle between the British and Germans, and the German cruiser *Dresden* was sunk.

Here's the official DXpedition team photograph taken on Juan Fernandez Island. From left to right are the author, Randy Martin, KØEU; John Torres, CEØZAM; Bob Allphin, K4UEE; and Bob Hamilton, KØIYF.

Since that time the islands have remained remote and quiet. In 1935 the Chilean government declared them a national park. In 1966 the main island of Masatierra was officially renamed Isla Robinson Crusoe, to acknowledge the role of Alexander Selkirk in the history of the island group. Today the island is settled by about 600 Chileans, whose main source of income is fishing. Approximately 120 fisherman make a living from the famous lobster that inhabit the area. Tourism plays a very minor role in the economy, as the ecosystem is too fragile to support more than an occasional influx of visitors.

The Plans Begin

Juan Fernandez first caught my attention when I jumped into a pile-up for CEØ/JA7AYE in January 1995. I couldn't believe there was such a big demand for JF on 40 meter CW. Because I travel occasionally to Chile, I made a mental note to check on the possibility of taking a side trip to JF during my next visit. I thought that a setup similar to what I used at 9G1XA might attract some attention.

A few months later I ran into K4UEE, who was operating P40R just before the 1995 ARRL CW DX Contest. He mentioned that he was going to participate in the XRØY DXpedition to Easter Island, and was thinking about returning to Chile, then heading out to JF to activate it on the low bands. He was looking for someone to go along and help. Bob and I had first met back in 1993 on the Howland Island AH1A DXpedition. Further discussions led to a commitment to activate JF in mid-September 1995.

After our decision Bob contacted Mickey, CE3ESS, who jumped in and began to help us plan our DXpedition. Mickey was in close contact with John Torrez, CEØZAM, who spends most of his time on San Ambrosia island and is probably more well-known as XQØX. Occasionally, though, John spends time on JF.

Mickey offered the use of several Kenwood

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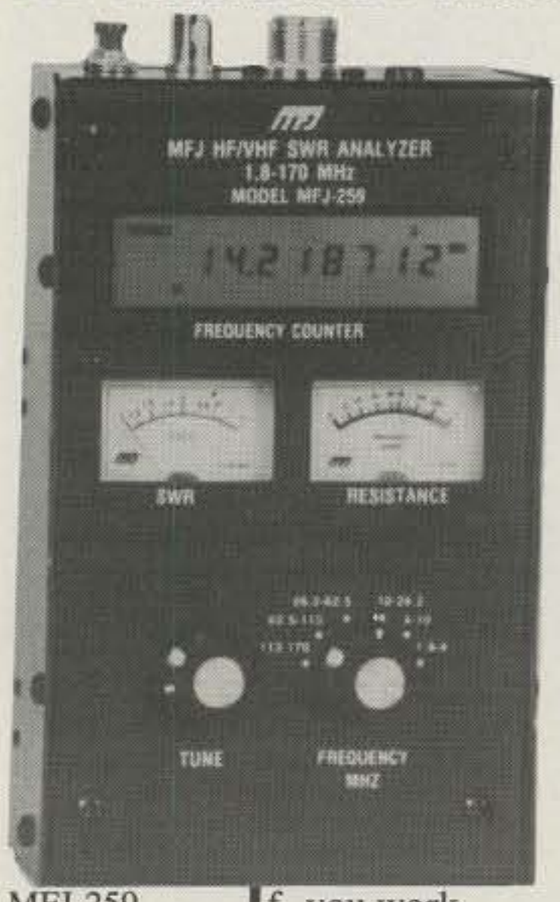

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Here's our plane being readied at Juan Fernandez International airport.

TS-450S tranceivers, two amplifiers, coax, a computer, and other miscellaneous equipment. He insisted that all Bob and I needed to do was show up with a keyer and a change of underwear. Mickey and John would take care of everything else. Bob and I could not believe our good fortune, although we insisted that we would bring more than just a Bencher and our BVD's!

About this time the Low Band Monitor came out with a "most needed country" survey for the low bands. It turns out that CEØZ was needed by 98 percent of the readers on the low bands. On top of that, the *DX Magazine* survey showed JF was the 30th most needed country in Europe. Bob and I knew we could be very popular if we committed to the low bands and spent as much time as we could working Europe.

In early summer 1995 Bob suggested we add another operator to our DXpedition. He knew he would be burned out from his stay on Easter Island prior to the JF trip. I had been thinking the same thing. I had just finished a Field Day weekend at KØNA/Ø, where we ran two stations with only three operators. Although it is not hard to do one contest weekend shorthanded, it is almost impossible to keep up that kind of pace for an entire week. With such a high demand, even as much as Bob and I like to operate, we knew that things would turn into a grind.

Coincidentally, around this time I talked with Bob Hamilton, KØIYF, at a Mile High DX Association meeting. Bob was bummed out because his planned trip to Desecheo, KP5, had been cancelled due to orders from the U.S. Coast Guard. Landing on Desecheo was prohibited until further notice due to occupation by Haitians. He said he was itching to go on a DXpedition in the fall.

When I told Bob Allphin about this conversation, we agreed that KØIYF would be a good choice for our third operator. Bob had already done numerous stints from overseas locations such as XW, KP1, J6, and V31. The next day I asked Bob, KØIYF, if he would join us, and he agreed. Within a few days his airline reservations were set and we began planning our equipment in detail.

My only regret in adding Bob, KØIYF, to our crew is that it meant we now had two "Bobs" on the trip. I solved this on the island by calling Bob Allphin "Bob Alto" (tall Bob) and Bob Hamilton "Otro Bob" (the other Bob). For the rest of this article, I will refer to them as Bob A. and Bob H. Now I see why the 3YØPI gang called N4CGK "Wilber" (his last name) so as not to confuse him with Bob, KK6EK!

The Trip Begins

Departure day didn't come soon enough. Bob H. and I departed from Denver on Monday, September 11th. We had an uneventful trip via Miami, arriving in Santiago at 7:30 AM the following morning. My first real test of Spanish occurred with the customs agents. They wanted to know what was in Bob's bag, which contained the satellite antennas and coax. I explained that the bag contained amateur radio antennas and cables.

In my first attempt I told the customs agent that we were going to *leave* everything on Juan Fernandez when we returned. After I saw the look on his face, I quickly changed verbs and told him we would *take* everything when we returned from JF. After several more repeats, trying to restate our intentions in every way I could think of, the agent agreed to let us through. I'm still not sure what it was that I told him exactly. The fact that I was able to show him our CEØZ license helped a lot.

It was cold and rainy in Santiago. Bob and I took a van and were almost dropped off at the wrong hotel. Finally, we made it to the Manquehue Hotel in the Los Condes district. Bob A. was there to greet us. After checking into our room, Bob H. and I joined Bob A. for breakfast.

The following morning the clouds were breaking up. We called the charter company, and they said that the flight was "on." We piled the gear and ourselves into a little Lada (similar to a Fiat) and headed for the airport. I still can't believe that the three of us, plus 145 kg of gear, actually fit into this little car. More than once along our route the rear wheels scraped against the fenders.

We finally arrived at the desk of Mary Fig-

ueroa at the airport. Mary is the agent who handled all the arrangements for us. She weighed all of our gear (145 kilos) and then collected our money. We were soon outside loading our bags into an old twin Cessna 310. Our pilot, Santiago Figueroa, was Mary's husband. She assured us that he was a good pilot and had made over 1500 trips to JF.

As we got on board, I noticed that the plane was equipped with a Kenwood TS-50! After we took off, Bob A. fired up as K4UEE/Aeronautical Mobile. He worked a few statesiders on 20 meters, and then talked to some of the Chilean amateurs on 7 MHz. Then all three of us drifted in and out of sleep. As we got nearer to the island, we became very anxious. None of us knew what to expect, or what we had gotten ourselves into.

Arrival on Juan Fernandez

Finally, the island was in sight. It looked like something out of the show "Fantasy Island"—very rugged and beautiful. We flew by the village on our way to the airport, which is on the other end of the island. It was a beautiful view, and we could see the radio tower that would be our 160 and 80 meter delta loop support.

The airstrip is dirt, and you land slightly uphill. You touch down just after clearing an almost vertical cliff that must be 200 to 300 feet high. At the end of the strip is a rather steep hill that reminded me of a runaway truck ramp. We stopped at the top of the ramp and turned around. We then taxied down and parked next to the small shack that is the Juan Fernandez International Airport. John Torrez, CEØZAM, was part of the welcoming committee.

KØEU displays a big "thumbs up" to celebrate 18,000 contacts from the island.

The view is fantastic from the airport. At least one previous expedition took place from the airport itself. This is certainly a better radio location, but the logistics of operating from here would have been much more complicated. We would have needed generators, tents, food, and water. As it turned out, we were comfortable in town, and certainly got to meet a lot more people. Afterwards, we all agreed that our experience was much more enjoyable interacting with the locals than it would have been had we isolated ourselves at the airport.

As we unloaded our gear, John told me that propagation from the village was very good to Europe and the USA, but not very good to Japan. VK and ZL were very difficult. He had made numerous contacts from the island using a simple dipole and a barefoot transceiver. We hoped that our Yagis and the Alpha would make things easier. The two Bobs, John, and I walked

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A beautiful view of Cumberland Bay and the village of San Juan Bautista as seen from the top of the island, Alejandro Selkirk's Lookout.

from the airport down a four-wheel drive road that led to a protected bay complete with boat dock. Our gear came down in an old Willy's jeep, which is one of only a handful of vehicles on the island.

A group of fur seals was waiting for us at the boat dock. The weather was clear and calm, but a bit on the cool side. It was a two hour trip from the airport dock to the main dock at San Juan Bautista. This gave us plenty of time to talk with John, while getting a close-up view of the island.

We arrived at the main dock and unloaded our gear. The main mode of transporting baggage is by wheelbarrow. With the help of a fellow named Robinson Crusoe (really!), we got our things to the hotel. Our home for the next eight days was the "Villa Green," which has been the site of several previous operations. More than one generation of the Green family has witnessed the crazy behavior of an amateur radio DXpeditioner. We noted that the hotel guest book had been signed by Lloyd and Iris Colvin.

Our operating site was an area that used to be a fort, but is now the site of the Civil Aeronautics Board. They maintain a radio-direction beacon and a weather station on the site. The employees live in several houses that are on the site. A visiting technician actually stayed in one bedroom that was situated between the two operating positions. He learned to hate SSB, but loved CW!

We found that John and his friends had been very busy during the previous weeks. We arrived at the operating site and were greeted by three already-installed antennas. There was the 2-element 40 meter Yagi, the 3-element 12/17 duoband Yagi, and an A-3 tribander, all from Cushcraft. Inside we found two complete setups, in separate rooms, beckoning us to get on the air! Well, as tempting as this was, we had some business to attend to first.

Prior to arriving, we all had agreed that our number one priority was to get the antennas up for 160 and 80 meters. Although we had been travelling for most of the day, there was still some daylight left. We prepared the wires and rope for our full-size delta loops, and I headed up the tower. The tower is 130 feet high and self-supporting. It is used for the VOR beacon during the day. We had obtained permission to hang our loop antennas off the tower.

For those of you who have never wrestled with a full-size 160 meter delta loop, you are really missing out on a treat. The length of the loop is roughly 550 feet, with the horizontal base portion running almost 200 feet! We managed to get the 160 meter loop installed and tuned by early evening, using flashlights after the sun went down. Already we could tell that some of the locals thought we were loco.

Bob H. now turned his attention to erecting his satellite antennas and getting the satellite station operational. Bob A. and I did some rearranging of the two stations and got the laptop computers with CT9 ready to roll.

We knew that people probably were looking for us, so we got on the air. I had missed a schedule with our pilot station, N2IC/Ø, but was hoping he might find us if we started out on 20 meter SSB. I called CQ on 14190 and a pile-up quickly formed. After working a couple of dozen stations, Steve, N2IC, called in. We gave him a quick rundown of our current status and informed him that we would be on 160 and 40 CW that night.

The following morning Bob H. attempted to make satellite contacts with Japan during the only common window we would have during the DXpedition. Sadly, no Japanese signals were heard, no doubt leaving more than a few disappointed satellite enthusiasts in JA-land. Undaunted, Bob turned his attention to the other satellite DXers waiting in the wings.

The weather was cold, cloudy, and it rained from time to time. This is not good weather for antenna work, but we all know that antennas always seem to work better if they are put up under lousy weather conditions. We got the full-sized 80 meter delta loop up and erected a 30 meter wire vertical. We kept one station running during all of this. When we finished up with the antennas and tried to get on the air with the

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CEØZ DXPEDITION CONTINENT STATISTICS

CW

	160	80	40	30	20	17	15	12	10	All	%
N. A.	399	640	1492	960	550	433	283	101	103	4961	28.3
S. A.	13	30	70	27	21	24	43	5	14	247	1.4
Europe	148	228	798	425	245	936	527	431	255	3993	22.7
Asia	2	190	832	225	14	11	4	0	0	1278	7.3
Africa	1	1	7	2	1	3	3	1	0	19	0.1
Oceania	4	11	7	0	0	0	0	0	0	22	0.1

SSB

	160	80	40	30	20	17	15	12	10	All	%
N. A.	0	253	465	0	932	658	332	104	64	2808	16.0
S. A.	1	61	129	0	65	52	61	9	18	396	2.3
Europe	3	201	466	0	80	764	962	279	438	3193	18.2
Asia	0	2	83	0	7	4	5	0	3	104	0.6
Africa	0	4	5	0	6	10	15	11	15	66	0.4
Oceania	0	8	5	0	1	1	0	0	0	15	0.1

RTTY

	160	80	40	30	20	17	15	12	10	All	%
N. A.	0	0	0	0	110	3	100	0	0	213	1.2
S. A.	0	0	0	0	0	0	11	0	0	11	0.1
Europe	0	0	0	0	29	5	167	0	0	201	1.1
Asia	0	0	20	0	0	0	1	0	0	21	0.1
Africa	0	0	0	0	0	0	1	0	0	1	0.0
Oceania	0	0	0	0	0	0	0	0	0	0	0.0

Note: Includes 476 unique callsigns in 160 log. 225 Satellite QSOs were also made.

Table I– Continental statistics of the CEØZ DXpedition.

second station, we were in for a nasty surprise! Inter-station interference was terrible! Even with both stations running barefoot, it was impossible to run two stations at once.

We had brought two sets of DuneStar model 600 filters, which worked great when both stations were on a "normal" amateur band. However, when we tried to run a station on 17 or 12 meters, we couldn't use the DuneStar. It wasn't DuneStar's fault. The model 600 isn't designed to work on WARC bands. I had figured (wrongly) that we could run a WARC station without a filter as long as the other station was on a normal band and used the DuneStar.

The worst part was that there never seemed to be more than one of the normal bands (10, 15, or 20) open at the same time. Even if they had been, we had advertised our trip as a low-band/WARC-band DXpedition. That meant we had to be on either 17 or 12 meters during the day. The inter-station interference was a real setback. Bob A. insisted that we had to come up with a way to solve the problem.

Bob A.'s solution was to move the WARC Yagi so that it was separated from the triband-er by about 150 feet. He talked to John Torres, and John agreed to round up some help and move it the next day. We stretched our limited coax supply to the max, but sure enough, after the antenna was moved we were able to run two stations, with KW amps, and had no interference problems!

Friday turned out to be the nicest day, weather-wise, that we would see during our visit. It was sunny, and there were no clouds surrounding the tops of the mountains! Even though it would soon be Friday evening in Europe, we decided that this might be our only chance to get to the top of the island and see the Alejandro Selkirk Lookout. This is one of the main attractions for visitors to the island.

It was quite a hike to the top. The trail is steep and gets very slippery as you near the top. Bob H. and I, who are in fairly good shape and have the added benefit of "mile-high" blood supplies and lung capacity (we are both from Denver), were able to get to the top in around 35 minutes. The view was fantastic! The village of San Juan Bautista looked miniscule down below. We could now see why it was so difficult to get a signal out in any direction except the north and northeast. When we first arrived at the top, we had an unclouded view of the western end of the island where the airport is located. Five minutes later it was completely covered.

The Pile-ups

There were always some fantastic pile-ups. Bob Allphin has fond memories of some 160 meter openings to Europe. I listened in on Bob during several of these openings. I can assure all of you that if you did not get into the 160 meter log, it wasn't because Bob was ignoring the weak signals. On the contrary, he seemed to relish pulling the almost ESP signals from the noise.

Bob H. seemed to enjoy the satellite work and was even rebroadcast one night on a public radio show back in the US. I was really impressed with the way both Bobs were able to maintain a positive attitude during the pile-ups. I must admit, there were times when I got a bit short-fused with the mob.

The pile-up I won't forget is the one we generated on 75 meters SSB one night. Bob H. started things out and as always was very polite to the pile-up. Unfortunately, the pile-up wasn't

very polite to Bob! Bob soon became frustrated with things and he let me take over. With the help of the CT-9 check partial function, I was able to start unravelling the mess. I had people spread out over 20 kHz. Normally, I like to limit the spread to 5 or 10 kHz, but it seemed that almost every signal was the same strength.

The stateside boys were patient and waited while I knocked off as many Europeans as I could. Finally, sunrise came in Europe and I switched to stateside. Things continued for another two or three hours. I'll never forget one contact we had that night. It was like pulling teeth to get most of the callsigns, but suddenly out of the blue this voice came through over the top of the pile-up. It was like he was in the next room! It was KMØJ in Missouri. I told him how impressive his signal was. He replied that he was using a full-size 2-element Yagi at 180 feet. I jokingly replied, "Oh, one of those small compact jobs, huh?"

Heading Home

All good things must come to an end, and this DXpedition was no exception. We were tired and worn out from our adventure. It would be nice to get home, but it was going to be a sad goodbye. We had all grown close to our friends on the island. Our last few QSOs were to Japan on 40 meters on Thursday morning local time. The rigs were shut off, and we began to disassemble the stations. It was chilly and misty as I climbed up to the top and cut loose the two delta loops. We rolled up all the coax, but John insisted that we leave the antennas up, and he and his friends would dismantle them later. We donated all the antennas we brought and most of our coax to the Juan Fernandez radio club. John promises to be on the WARC bands during his next visit to San Felix! We also gave John our copy of the WF1B RTTY software to make it easier for him to run RTTY from San Felix.

The flight back was not uneventful. We experienced severe icing, and one of the engines got a bit warm due to carberator ice. Luckily, it never got so hot that we were in danger. Someone had thoughfully provided a bottle of scotch, some glasses, and some ice so we could celebrate. It truly felt good to sit back, relax, and toast to our success.

We spent the next day touring Santiago, buying souveniers, and generally taking it easy. That night we headed for the airport. To our surprise, the members of the XRØY DXpedition were there in transit. It was like old homecoming week for Bob A., while Bob H. and I got to meet many of them for the first time.

Our Thanks

Nobody pulls off a successful DXpedition without the help of a large supporting cast. Ours was no exception. We owe a debt of gratitude to many people. First, and foremost, we thank John Torres, CEØZAM, for bending over backward in every way to make our trip a success. Next we thank Mickey, CE3ESS, for all of his efforts. Kudos to the Chilean Civil Aeronautics Board for allowing us to operate from their grounds and use their tower. We highly recommend the Hotel Villa Green and thank them for their wonderful hospitality.

Thanks to all of you amateurs who directly supported the operation, and finally, thanks to all of you DXers out there who helped make it a wonderful experience! ■

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The W2IHY Audio Equalizer And Noise Gate

BY DAVE INGRAM*, K4TWJ

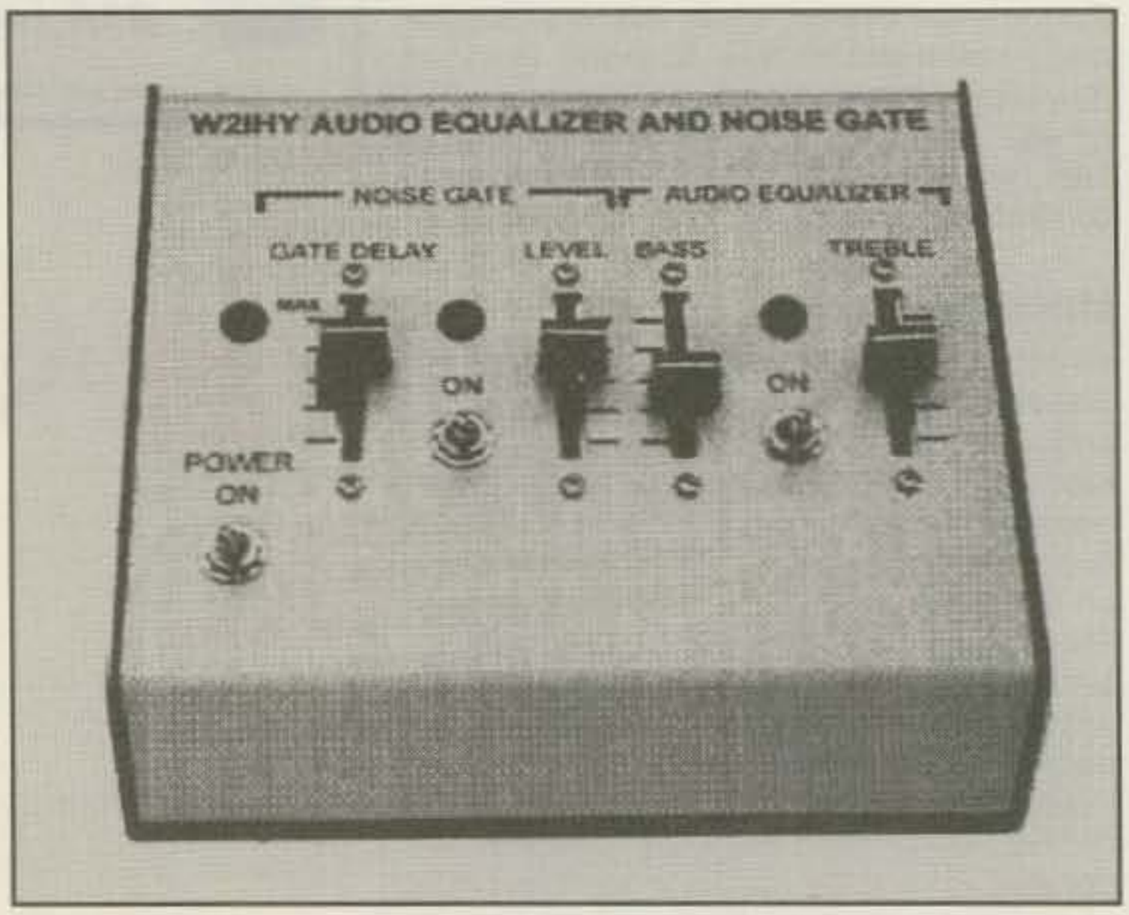
As most radio amateurs agree, a clean transmitted signal with exceptionally good audio produces the most favorable on-the-air image. Old-pro contesters and DXers also agree that emphasizing the higher and more articular tones in one's voice proves quite helpful for rising above the crowd in pile-ups. Those combined thoughts explain why many of us spend so much time (and money!) selecting just the right microphone and key to fit our individual voice or fist. Some operators want to enhance their limited-range voice with full-bodied audio, while others prefer to emphasize higher tones for a "super speech compressor" effect. Then, too, we often enjoy "changing faces" (voices) to complement the atmosphere of a particular band or occasion—smooth and casual one day, sharp and penetrating another.

In the past everything imaginable has been tried for matching a microphone to one's voice. Socks have been placed over mics to reduce "tinniness," and toilet-tissue tubes have been fitted onto end sections of long-neck mics to minimize bassiness. Unfortunately, the process was more "dinking" than successful. Yes, and if and when we finally found the right mic or sound-enhancing gadget, we then realized other unnoticed sounds (such as an amplifier's blower, air conditioner, or wind noise when mobile) were degrading our new-and-improved sound. The "experimental cycle" then repeated itself.

Well, there's good news, gang: a clever plug-in-and-use solution anyone can hook up is now available. It's the W2IHY Aadio Equalizer and Noise Gate, and it can make your transmitted audio stand out like a ray of sunshine on an otherwise cloudy day. It also has a built-in noise gate that can be set to remove in-shack noises so you sound like you're in a radio studio rather than an airplane cockpit. Yes, and this device is directly compatible with all popular 8-pin Kenwood, Yaesu, and ICOM microphones and transceivers. It even has a three-position "KYI" switch so owners of different brand home and mobile rigs can quickly change (or mix!) mics and transceivers. This is one accessory everyone will find beneficial!

The W2IHY Audio Equalizer and Noise Gate is enclosed in an almond and gray colored, slanted-front cabinet measuring 2.5"H × 6"W × 5"D. It is supplied with a 12 volt DC "wall adapter" for home use, or it can be battery powered for mobiling. It has top-mounted controls for mic/audio level, bass and treble response, and noise-gate delay. Red and green LEDs are also included for monitoring operation of the equalizers and noise gate. Recessed on the bottom are controls for setting mic input and output levels so the unit can be used without readjusting your rig's mic gain, plus a jumper for swapping between electret mics (which require a few volts for operation) and dynamic mics (that can be damaged by applied voltage). Sockets for DC input, mic input, and output, the mic selector switch, plus RCA phono sockets for connecting a home-rigged mic and/or foot PTT switch are included on the rear panel. You can thus "mix and match" mics and rigs by using the rear selector switch and adding the appropriate cable between the equalizer and transceiver. There is one other special and appealing touch to this unit: It is available in kit form or fully assembled and ready to use, and the price of either version is quite reasonable for what you get.

I recently added one of these units to my rig(s), and I must say it's a winner. In many ways it reminds me of the ICOM SM-10 four-band, graphic-equalized mic I had several years ago and dearly loved. Unfortunately, it died from an overdose of RF feedback, and ICOM had discontinued making the little gem at about that time. Not only is the W2IHY equalizer a good replacement, I also can use it with different microphones and transceivers. Furthermore, the W2IHY unit is especially designed to work in high RF environments. In addition, the noise-gate section eliminates so many of the extraneous noises close to the shack. Are the improvements in my transmitted audio really that noticeable? Judging by unsolicited on-the-air compliments, I can say yes without reservation. I should also mention there is not a hint of distortion or SSB splatter (assuming the transceiver's mic gain is not excessively high, but that's an operator problem and not a fault in the W2IHY unit).



The W2IHY Audio Equalizer and Noise Gate. The unit is plug-in compatible with Kenwood, Yaesu, and ICOM rigs and does an outstanding job of tailoring transmit audio to fit the user's voice.

Another convenient aspect of the equalizer is the limited "can't miss" range of its controls. Even when working alone without a second rig or receiver to monitor your audio while setting bass and treble, the sound does not go "all-bass mushy" or produce an "all-treble tin can" sound. I feel quite comfortable recommending it and think you will like the way it enhances your voice. After all, other stations recognize us by our voice more than our face—and we all know first impressions last the longest.

The W2IHY Audio Equalizer and Noise Gate uses a combination of analog and digital devices for audio signal processing, yet building it from kit form seems easy if you have the time. (I don't; just grabbing a few minutes for QSOs is challenging!) The parts—three ICs, a couple of transistors, and a couple dozen resistors, capacitors, etc.—mount on a single easy-to-see and handle PC board. You install them in a three-step manner according to the kit's instructions. It's not "Heathkit simple" (solder the blue wire to the right terminal on SW-4), but it's close. I would say anyone who can read a schematic and solder can build it within a weekend of casual work. The kit's instructions and (assembled) operating manual are well written and easy to understand. The unit is backed by an unconditional (satisfaction or money back) 90-day warranty.

The producer, Julius Jones, W2IHY, is an old-time audio engineer and SSTV pro with several innovative ideas and designs to his credit. He is one of amateur radio's original "good guys," dedicated to promoting great sounding audio, and his goal of perfection is reflected in this unit. The kit sells for $99.99, and the wired unit sells for $129.99, plus shipping and handling.

For more information on the W2IHY Audio Equalizer and Noise Gate, contact Julius D. Jones at 19 Vanessa Lane, Staatsburg, NY 12580 (telephone 914-889-4933 days, 914-889-4253 evenings). ■

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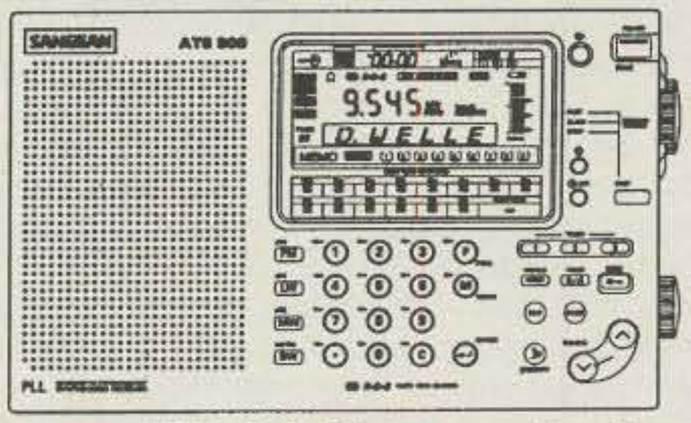

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Average suggested list price is 59 cents per foot. For more information, contact Davis RF Co., P.O. Box 730, Carlisle, MA 01741 (1-800-328-4773; e-mail <DavisRFinc@aol.com> or <http://www.cqinternet.com/davisrf>), or circle number 100 on the reader service card.

New "How-To" Guide From Index Publishing

Index Publishing Group, Inc. has released *Radio Monitoring for Beginners* by T. J. "Skip" Arey, WB2GHA. The book is a complete "how-to" guide for monitoring medium-wave, shortwave, and VHF/UHF transmissions, including scanning. Skip Arey has written the "Beginners Corner" column in *Monitoring Times* magazine for years and reprints of his articles have become teaching tools for those new to the hobby of radio.

For more information, contact Index Publishing Group, Inc., 3368 Governor Drive, Suite 273F, San Diego, CA 92122 (phone 619-281-2957; fax 619-281-0547; or e-mail <indexbooks@aol.com>; internet <ipgbooks@indexbooks.com>), or circle number 101 on the reader service card.

Premier Communications New Dual-Band FM Handheld

Premier Communications has announced a new FM handheld. The ADI AT-600 features simultaneous 2 meter/70 cm receive, separate volume and squelch controls for each band, full duplex operation, and crossband repeat mode. It also has 200 memories that store any frequency, TX offset and CTCSS tone, 10 DTMF autodialing memories, several scan modes, programmable alphanumeric display, battery save mode and auto-off function, and fully illuminated keypad and display. Additional features include built-in CTCSS encoder and decoder for silent monitoring and DTMF paging for group calling.

The new AT-600 transceives from 144–148 MHz and from 430–450 MHz. It includes extended receive of the 108–137 MHz AM aircraft band, 137–174, 350–470 MHz, and 900–985 MHz FM bands. The unit is MARS/CAP capable, off-air cloneable, and can be PC-programmed with optional software.

ADI's AT-600 measures 5"H × 2"W × 1.4"D and delivers 2.5 watts output (high)/.5 watt output (low) with its supplied rechargeable battery pack. An optional 12 volt battery pack can be added for increasing output to 5 watts.

For more information, contact Premier Communications, 20277 Valley Blvd. #J, Walnut, CA 91789 (phone 1-800-666-2654; fax 909-869-5710), or circle number 102 on the reader service card.

Alinco Introduces DR-140T 2 Meter Mobile/Base

Alinco Electronics has added a new 2 meter mobile/base radio to its product line. The DR-140T sports several standard features, including alpha-numeric display, aircraft band and extended range receive, 51 memory channels, CTCSS encoder, European tone bursts, and DTMF microphone. The new alpha-numeric display is capable of showing up to seven characters and numbers for each memory channel. Included with the base Latin character set are symbols of Cyrillic alphabet characters, as well as numbers 0–9. The complement of memory channels is 50 plus a "call" channel for a total of 51. Each memory channel is capable of recording frequency, CTCSS tone or European tone burst, alpha-numeric display data, repeater offset and non-standard offsets of up to ±99.995 MHz (full tuning range of radio), according to Alinco engineers.

The DR-140T can also be equipped with the EJ-20U CTCSS Tone Decode Unit, which adds capabilities to the radio including receiver tone squelch operation, "busy channel" lock out, and the ability to operate with different transmit and receive CTCSS codes loaded into any memory channel.

For more information, contact Alinco Electronics, Inc., 438 Amapola Ave., Ste. #130, Torrance, CA 90501 (phone 310-618-8616; fax 310-618-8758), or circle number 103 on the reader service card.

The R.F. Connection RG-8X Type Coaxial Cable

The R.F. Connection has announced the availability of International Electronic Wire and Cable Company's new RG-8X type coaxial cable. No. 9092 is an RG-8X size 50 ohm cable that comes with a Type II A non-contaminating polyvinyl-chloride jacket and a foam polyethylene dielectric. The cable uses a 16 AWG tinned copper stranded center conductor and 34 AWG

bare copper braid that provides 90% coverage. The velocity of propagation is 78%. The power-handling capabilities of the cable range from 1 MHz with 4000 watts of power-handling capability to 3000 MHz, 26.0 dB attenuation per 100 feet, with a power-handling capability of 65 watts.

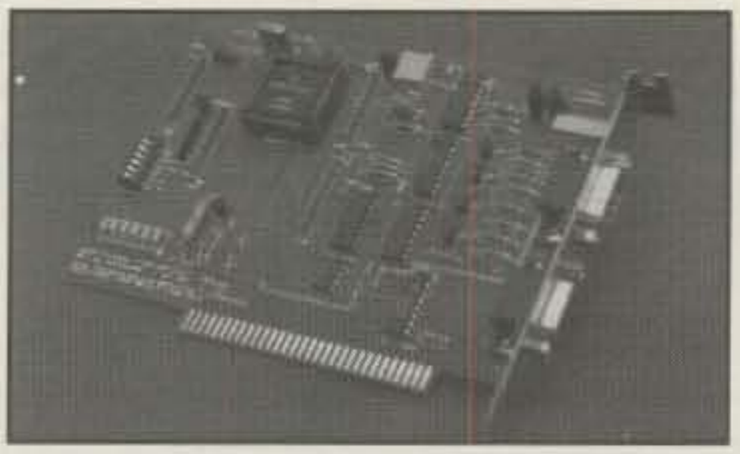
The R.F. Connection is currently carrying the cable for 25¢ a foot, and 23¢ a foot for lengths of 100 feet and greater. For more information on the cable or to place an order, call Joel or Jeff at 1-800-783-2666 or 301-840-5477; fax 301-869-3860; or check out their Web page at <http://www.therfc.com/>.

SARtek-1 Universal Antenna Rotator Controller

SARtek-1, from Personal Database Applications, is the first universal antenna rotator controller that will work with most rotors, even those not originally designed for computer interface. SARtek-1 consists of a board that fits in a standard PC slot, and a small relay board that mounts inside the rotor controller's cabinet. The unit plugs into a standard 9- or 25-pin serial port on the computer. It is microprocessor controlled, featuring dynamic feedback, automated brake control, heavy-duty relays, and easy installation. Operational accuracy is within three degrees.

Operation on Yaesu SDX model units is a plug-in operation. Other controllers require that you solder color coded leads to the left, right, brake, feedback, and ground connections, as per the illustrated manual, followed by running through a self-calibration routine.

Included with SARtek-1 is Windows 95 software that provides point-and-click antenna aiming, or keyboard input of heading, grid square, or callsign prefix. It displays short and



long headings, return headings, distance, country, ITU and CQ zones, latitude and longitude, and local, UTC, and destination clocks. It also features zoomable windows, complete customization of color and fonts, and foreign-language support.

SARtek-1 interfaces to LOGic logging software. It may also be controlled by any programming language capable of accessing a serial port or simple Windows DDE interface. Programming specifications are included with the product and are available to any developer wanting to support SARtek-1.

SARtek-1 is available exclusively from Personal Database Applications for $179 plus $5 insured shipping to U.S. and Canada, or $20insured airmail delivery to other countries. Rotor brand and model and serial connector type (9 or 25 pin) must be specified when ordering. For further information on SARtek-1 Software Interface for Windows 95, contact Personal Database Applications, 1323 Center Drive, Auburn, Georgia 30203-3318 (phone 770-307-1511; fax 770-307-0760; or e-mail them at <pda@hosenose.com>; or on the Web <www.hosenose.com/~pda/sartek>), or circle number 104 on the reader service card.

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INTERMOD SOLUTIONS from DCI

What is Intermod?

Intermod is the common name for the interference we hear from other transmitters such as pagers, police and taxis. It stands for Intermodulation Distortion and occurs when the RF amplifier in your receiver is driven non-linear by a strong signal. Two or more signals then mix in your receiver's RF amplifier and create a signal on your listening frequency.

HIGH QUALITY, LOW LOSS, PASSIVE BANDPASS FILTERS

Here's what a DCI Filter can do for *YOU!*

A handheld radio usually operates properly with a rubber duck antenna, but when it is connected to a mobile or base antenna, the HT becomes susceptible to intermod. This happens because some of the signals become strong enough to drive the RF ampliffer non- linear. DCI filters allow you to benefit from the gain of a high performance antenna without creating an intermod problem.

Mobile radios have better intermod immunity than handhelds, but if the signals are strong enough, mobiles too will be susceptible to intermod. Whether or not this happens depends on the radio, and the strength and frequency of the signals. Some metropolitan areas have so many strong signals that most VHF/UHF amateur transceivers experience intermod. The DCI filters are very effective in reducing intermod in high RF environments.

In many situations, a DCI filter will increase the sensitivity of a base station or repeater, particularly when using a low-noise preamp. The increase occurs because the DCI filter reduces the strength of both background noise and out-of-band signals. The result is less intermod-generated noise on your active frequency.

DCI bandpass filters are first-class filters with first-class specifications. They reduce the strength of interfering signals while allowing the signals you want to hear to pass through at virtually full strength. They're a worthwhile addition to any mobile, base station or repeater.

Features and Benefits

- Eliminate the random squeals, squawks, beeps, and strange voices from your VHF or UHF radio.
- Improve receiver sensitivity
- Hear the signals you want to hear, even in crowded urban centers with strong police and paging systems
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BY KARL T. THURBER, JR., W8FX

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Multifarious March

The ides of March, in like a lion but out like a lamb—these are some of the ways we describe March. In any case, with winter ending and spring soon to bloom, March is indeed a multifarious month, and so is our column this time around. Let's begin.

Antenna Notes

Premier Communications Dualband Mobile Antennas. Premier Communications distributes the imported ADI line of VHF/UHF transceivers, handheld and mobile. The firm also offers a line of VHF/UHF antennas, mounts, and cable sets for mobiles, as well as speaker mics and antennas for handhelds.

Of special interest to readers are the Premier PNC-2 and PNC-4 dualband mobile antennas and mounts. The 24 inch tall PNC-2, known as the "loud shorty," is pretuned, broadbanded, and set for 146.5 MHz, although it covers 130-165 MHz and 400–480 MHz and can be used for scanning to 900 MHz. The 37 inch tall PNC-4 is a gain antenna for 2 meters and 70 cm; it has a tilt-and-swivel, fold-over feature for garaging that locks in place when raised.

The antennas use a sturdy radiator with a mild taper to minimize flexing, wind flutter, and standing wave ratio (SWR) changes when mobiling. A unique dual base fitting screws onto a regular UHF/SO-239 or an NMO/Motorola mount. This makes the antennas suitable for new antenna installations and for antenna upgrades or replacements. Both antennas handle up to 100 watts.

For pricing and details, contact Premier Communications, 20277 Valley Blvd. #J, Walnut, CA 91789 (1-800-666-2654).

Wirecom Wire and Cable. Wirecom™ is a North Carolina firm operated by William W. Van Nuys, N4OOC. It offers a variety of "wire and cable for the amateur and professional." Some featured products include stranded 450 ohm ladderline in three wire sizes (#18, 16, and 14 AWG, for low, medium, and high power); double-weave black Dacron rope in four weights; several types of copper antenna wire; shielded and unshielded rotor cable; coaxial cable; and a variety of coax and other connectors, antenna accessories, and parts.

I'm not aware that a catalog is offered, but a price list is available from Wirecom, Inc., P.O. Box 2569, Asheville, NC 28802 (phone 1-888-298-9473; Internet <wirecominc@aol.com>).

News from OUTbacker. The popular OUTbacker® mobile antennas, covered in December 1990, are manufactured in Australia by Terlin Aerials. Their commercial counterparts have been used in the outback of the Northern Territories for over 20 years. As you might expect, the residents of the rugged outback rely on HF communications to keep in contact with civilian, government, and emergency services throughout the HF spectrum.

289 Poplar Drive, Millbrook, AL 36054

An inexpensive cross-needle SWR wattmeter, the MFJ-864, is offered by MFJ Enterprises. The new instrument covers 1.8 to 60 MHz, 144 MHz, and 440 MHz, and it lets you read forward and reflected power and SWR simultaneously. It features separate HF and VHF/UHF directional couplers, each with its own set of SO-239 coax connectors. Two power ranges are available, 30/300 watts forward and 6/60 watts reflected; each range for each band is individually calibrated. Two other units are offered: The MFJ-862 is for 144, 220, and 440 MHz, while the MFJ-860 covers 1.8-60 MHz.
(Photo courtesy MFJ Enterprises, Inc.)

Recently Terlin announced a new U.S.A. distributor, Alpha Delta Communications, a firm familiar to *CQ* readers. OUTbacker antennas offered through Alpha Delta include the PERTH and PERTHplus, and the OUTbacker 8 and HP, Junior and Junior Plus, Split and Tri Split, and Marine. Accessories, including trunk-lid mounts and spring bases, also are offered through Alpha Delta Communications.

Newest in the OUTbacker series is the PERTHplus, a 6 foot long mobile antenna. It's suitable for fender, gutter, or trunk mounting, or it can be hitch-mounted. The new antenna boasts coverage of all HF bands on one antenna, as well as 6 and 2 meters. Switching bands is easy, with no coils to change. Maximum power rating of the $289 polyurethane-coated antenna is 150 watts PEP. The basic PERTH antenna ($274) is similar but doesn't cover 6 and 2 meters.

Another popular OUTbacker stocked by Alpha Delta is the OUTbacker Junior Plus, a single whip 4 feet long that covers 75 through 10 meters plus 6 and 2 meters—an antenna no larger than a VHF/UHF collinear whip. It handles 150 watts PEP and is $249.

Complete OUTbacker details are available from Alpha Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962 (606-598-2029, or contact OUTbacker Antenna Sales International, 5 Yampi Way, Willetton 6155, Perth, Australia. You also can obtain more information by bringing up Terlin's OUTbacker Web page, found at <http://intercon.com.au/outbacker>.

MFJ-864 Cross-Needle SWR Wattmeter. Today most RF wattmeters handle several hundred watts or more, with an accuracy of ± a few percent. The most versatile ones are bidirectional: you can measure both forward and reverse (reflected) power. This means you also can use the meter to measure SWR. Most amateurs use SWR bridges to adjust their antennas, leaving them in place as a constant check on the transmitter and antenna system.

Many newer wattmeters have been digitized using LED bar indicators or LCD displays. Others are analog cross-needle types that show both forward and reflected power on the same meter simultaneously. This feature is a real help in visualizing the complete RF power and SWR picture—particularly useful when adjusting a transmatch or a new antenna.

A new and inexpensive ($69.95) cross-needle SWR wattmeter, the MFJ-864, is offered by MFJ Enterprises. The new instrument covers 1.8 to 60 MHz, plus the 144 and 440 MHz bands. With it, you can read forward and reflected power and SWR simultaneously. The unit features separate HF and VHF/UHF directional couplers, each with its own set of coax connectors. Two power measurement ranges are available—30/300 watts forward and 6/60 watts reflected—and each range for each band is individually calibrated. You can connect both HF and VHF/UHF transceivers at the same time, monitoring the SWR and the power of either at the flick of a switch, without swapping rigs or cables.

Two other units are offered. They are the MFJ-862, which covers 144, 220, and 440 MHz, and the MFJ-860, which covers 1.8–60 MHz only. Each device is protected by MFJ's full one-year "No Matter What"™ warranty, under which MFJ will repair or replace the unit, at their option, no matter what happens to it.

New Cushcraft Catalog. Cushcraft's amateur antenna catalog seems to get slicker all the time. Their latest catalog includes photos and specs on a number of new HF and VHF/UHF antennas.

New products include the Skylog HF log periodic antenna, which covers 13.5 to 32 MHz continuously; the AV80, an 80 meter vertical standing 36 ft. tall; the 719B and 729B 70 cm beams; the A270-6S, a 10 dB gain Yagi for 2 meters and 70 cm; the ARX-6, a 6 meter W1BX-style Ringo; two OSCAR antennas, the 22-element 22XB for 2 meters and the 38-element 738XB for 70 cm; and the 20-element A148-20T, a 2 meter cross-polarized Yagi. The catalog also describes the new "Cushcraft Gold" premium VHF/UHF mobile antennas and mounts, with introduction of the CG270M dual-band 2 meter/

Say You Saw It In CQ

70 cm antenna. These antennas are warranted for 2 years.

For a catalog, contact Cushcraft Corp., P.O. Box 4680, 48 Perimeter Road, Manchester, NH 03108 (phone 603-627-7877; Internet <http://www.cushcraft.com>).

New from Coaxial Dynamics. This Cleveland firm specializes in industrial-quality RF power measurement and computation equipment. Products offered include portable and rack-mounted directional RF wattmeters and plug-in elements, dummy loads, attenuators, frequency counters, field strength meters, signal tap-offs and samplers, heat exchangers, RF couplers, meters, and other RF accessories and switches. Most products are for heavy industrial communications applications, but some are suitable for relatively "low" amateur power levels.

One of their newest products suitable for amateur use is the Model 81050 broadband, directional, multi-range RF wattmeter; it's rated at 500 watts full-scale. Other new products include a line of low-power low-pass RF filters. The new filters handle 100 or 200 watts with attenuation levels up to 60 dB, depending on model, and they span operating frequencies to 400 MHz.

For product specs and pricing, contact Coaxial Dynamics, Inc., 15210 Industrial Parkway, Cleveland, OH 44135 (phone 1-800-262-9425; Internet <http://www.coaxial.com>).

Software Notes

Smith Chart Toolset Combo Package. Radio amateurs are always looking for PC programs to simulate impedance matching. They seek a sort of friendly software implementation of the paper-based Smith Chart developed by Phillip Smith at Bell Labs in 1939. The Smith Chart has become a powerful engineering tool for the solution of transmission-line and waveguide problems, but it's only available to those who are willing to invest considerable effort in learning it. In previous columns we described some user-friendly programs that try to eliminate the tedious, trial-and-error approach characterized by some Smith Chart programs.

Noble Publishing has come up with a comprehensive, triple-edged package to facilitate Smith Chart understanding and use. It's called The Smith Chart Toolset. At the heart of the package is winSmith, a Windows-compatible PC program by Eagleware. The program includes full Smith Chart operations, including inserting new elements, display of the current network, and more.

Designed to accompany the program is an update of the classic RF design reference book by the legendary Phillip Smith, *Electronic Applications of the Smith Chart*, released in a new 1995 edition. All of the original material is included, with considerable new information. A new chapter describes the winSmith software and includes some 48 training exercises.

A third component of the package is the "Introduction to the Smith Chart" 50 minute video course by Glenn A. Parker. It includes resistance circles and reactance arcs, the admittance chart, the gamma plane, transmission-line rotation, lossy lines, lumped-element and transmission-line matching, broadband matching, and notes on using the winSmith software.

The complete package is $199, but the components are available separately: winSmith $79; the book $59; and the video $99. All are from Noble Publishing, 2245 Dillard St., Tucker,

RF Applications, Inc.

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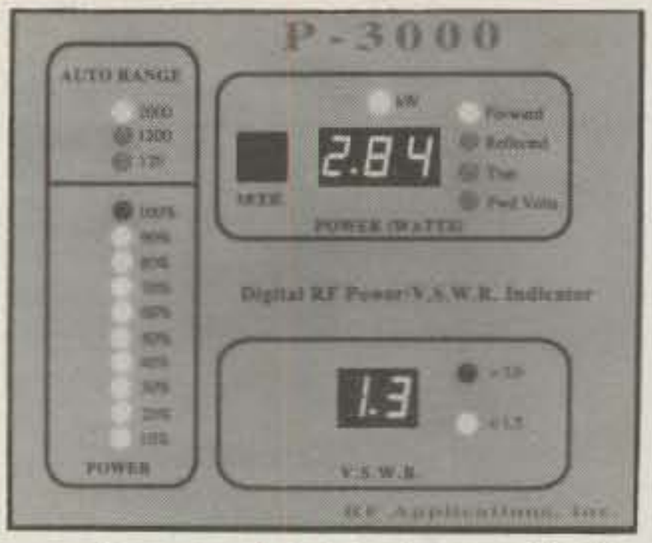

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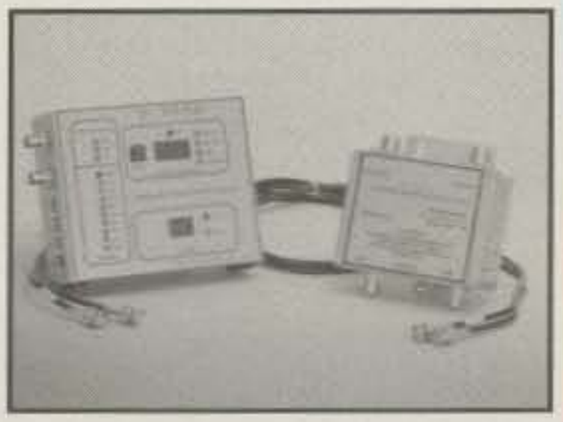

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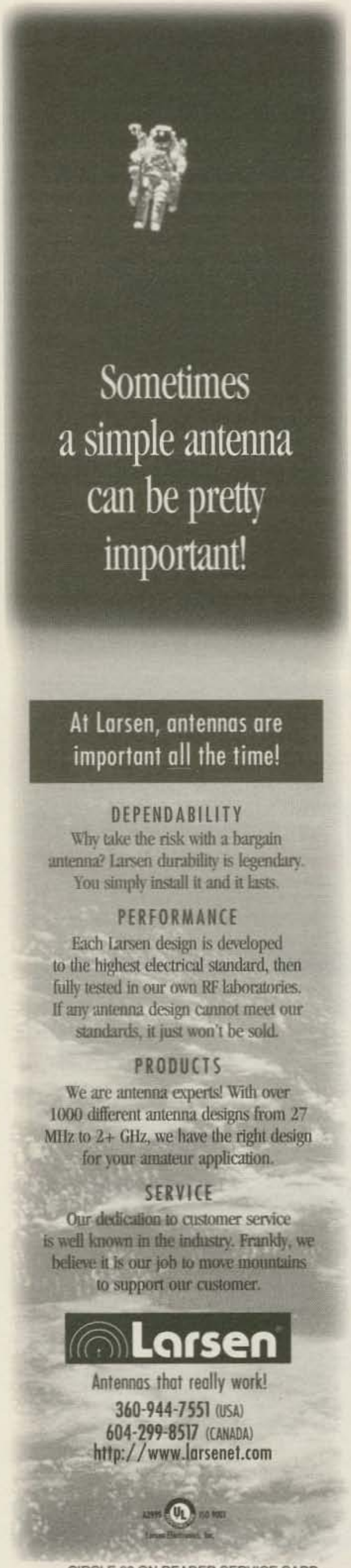

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GA 30084 (770-908-2320). Catalogs of RF design, antenna, and other communications-related electronics technical books, software, and videos sold by Noble Publishing and an affiliate, Crestone Engineering, are available from the same address.

FCC DataBase Search Program. In several columns we described the 10-10 software offered by James D. Hardy, K4HAV, covering various specialized recordkeeping programs for 10 meter contesting. Jim's programs are for those who chase "10X" certificates and awards sponsored by the 10-10 International organization—you know, the guys who proudly exchange their 10-10 numbers over the air. Some programs he offers include the K4HAV 1010 Contest Program, 1010 County Hunter Program, ZipCode/County Add-On Package, and 1010SB Sound Blaster. But that's not all Jim's been up to these days.

Recently Jim contacted us, noting that many amateurs purchase disk or CD-ROM based amateur callsign database programs. Although these are not free, they may be up to several months old whenever you buy them, and you don't get an update until you buy a new copy. He notes that the FCC has made its Amateur Callsign Database available on the net. It can be downloaded from the FCC's FTP site at <ftp.fcc.gov>. The database is current; it's fully updated every Monday, and daily callsign updates are posted.

The "raw" database as downloaded is of little use, however, prompting Jim to write a program to make it useful—the FCC DataBase Search Program. This is a freeware program that takes the FCC file you downloaded, strips out information not needed, condenses it, and breaks it down into prefixes that can be searched by a search routine. Typing in a callsign produces a display of the name, street address, city, state, and Zipcode. An address label can also be printed. Instructions for downloading from the FCC FTP site are given in the help screens.

Jim's program was inspired by an article in June 1996 *QST* by Fuat Baran, N2YGN. His article, "Accessing the FCC Amateur Database on the Internet," explains how to download the database files. However, the article doesn't tell how to use what you download; that's the purpose of Jim's program. Still, there's no such thing as a free lunch. The FCC database download from the FCC FTP site takes about 3 hours at 28.8 kbps, and the conversion process takes more time, depending on your PC's processor.

The beauty is that you can update your database every week if you want to, for free. The major requirement is that you need about 160MB of disk space to process the database; the resultant condensed database is about 32.5 MB. (Since the FCC breaks down the large database file into 11 smaller files by Zipcode, by downloading these small files and processing them one at a time you can reduce the disk space required.)

The basic program is freeware, and it can be downloaded from Jim's Web home page at <http://www.surfsouth.com/~jhardy> which has a link to the FCC's FTP site. Or you can go directly to Jim's FCC Database page at <http://www.surfsouth.com/~jhardy/fcc.htm>.

While the program is freeware, by registering it for $10 you will receive an e-mailed user ID file that unlocks several additional display features, including date of birth, age, county, azimuth, and mileage and bearing from the user. The user's latitude and longitude are in the user ID file, but it can be modified. Future program updates will be posted on Jim's Web page and can freely be downloaded.

Contact Hardy Data Systems, P.O. Box 7304, Tifton, GA 31793-7304 (phone 912-387-7373; Internet <jhardy@surfsouth.com>).

Note: N2YGN's *QST* article points to several online callsign servers that are based on the FCC database system. He maintains a list, with links, of all callsign servers he's aware of at <http://www.columbia.edu/~fuat/cuarc/callsign-servers.html>. You also can access the U.S. Amateur Radio Callsign Lookup Page at <http://www.ualr.edu/~hamradio/callsign.html>. It's updated daily.

Voyageur V1.1 for DOS. In the October 1993 column we discussed Shortwave Database, of interest to SWLs. Offered by Orchid City Software, the program contains thousands of radio station records and listings. Each station file contains the station's name, frequency, and schedule; language used; country; continent; a field for remarks; and the date the record was last updated. Fast, on-screen sorting, or sorting of data to printer, can be accomplished in several different ways.

The newest "database suite" from the publisher recently was completed and is known as Voyageur v1.1 Radio Database for DOS. It's a comprehensive package of database programs geared to the radio DXer and listener. The suite includes five main modules. These modules include: (1) Radio Station Database, which has over 10,000 records of station schedules and frequencies; (2) Utility Log Writing, for preparing log reports and printing in a variety of formats; (3) Radio Station Address, which includes thousands of station addresses and other information that you can print on mailing labels; (4) Radio Station Slogans, which includes station slogans in Spanish, English, French, and other languages; and (5) Radio Station DX/SWL Programs Guide, with schedules that let you find programs by day of the week, time of day, station, and other parameters. Each of the programs in the Voyageur suite is easy to use and allows you to change, update, or add data.

Voyageur v1.1 for DOS is $29.95 postpaid from Orchid City Software, P.O. Box 18402, West Palm Beach, FL 33416.

Update: Norton Antivirus 2.0 for Windows 95. In previous columns we noted that the most significant "soft spots" in Windows 95 are lack of virus-detection support, the absence of a complete set of powerful disk utilities, and weaknesses in desktop navigation and file management. Unfortunately, since the file structure is changed from Windows 3.1, existing utility software, particularly antivirus and file management programs, simply won't work under Windows 95.

In February 1996 we noted that Symantec had issued a major set of utilities for Windows 95 to address this situation. In that column we described the three products. These were Norton AntiVirus, a comprehensive, 32-bit antivirus protection utility; the Norton Utilities, a 32-bit package of utilities that offers system protection and data recovery; and Norton Navigator, for enhanced Windows 95 file management and desktop navigation.

Recently Symantec upgraded its antivirus utility to offer Norton AntiVirus 2.0 for Windows 95. The revised program offers unobtrusive protection with an easy-to-use interface and

program configurability. It stops all viruses before they cause damage or data loss with a line of defense that combines scanning, virus sensing, and inoculation. The program works in the background to provide continuous, automatic virus protection, even while working online and downloading files from the Internet.

Norton Antivirus 2.0 integrates a variety of new features. These include: LiveUpdate™, which provides access to the latest virus definition updates and program patches and updates, obtained online from a Symantec site; Striker, an advanced scanning engine that scans for the latest and nastiest of the elusive polymorphic viruses; and Repair Wizard, which guides you through the sometimes difficult and intimidating process of virus elimination, including repair of infected incoming files.

The new program's estimated street price is $69.95 ($29.95 to Norton Antivirus for Windows 95 users). For more information, contact Symantec Corporation, 2500 Broadway, Suite 200, Santa Monica, CA 90404-3063 (1-800-441-7234). (Also check out Symantec's Antivirus Center at <http://www.symantec.com/avcenter>. Updated virus definitions are available online the first of each month.)

WinWhatWhere™. Have you ever wondered just *where* all that time goes when you're using your PC, especially when you're working online? An interesting new product that recently came to our attention is WinWhatWhere™ for Windows 95, Windows 3.1x, and Windows NT. It's said to be the first program to efficiently track detailed usage for all applications you run under Windows.

A sophisticated product that does much more than just log when a program was launched and show elapsed time, WinWhatWhere offers detailed tracking and reporting of application programs used, web sites contacted, times, keystrokes, mouse travel and clicks, and even the caption of the active window. While WinWhatWhere is mainly for corporate users to check misuse of company PCs and employees' "goofing off," individuals can use it productively to help identify wasted time and even ergonomic considerations such as repetitive motion syndrome.

WinWhatWhere is $99 from WinWhatWhere Corp., 925 West Kennewick Avenue, Kennewick, WA 99336 (phone 1-800-242-4775; Internet <http://winwhatwhere.com>). Program upgrades are $25 to users.

From the Bookshelf

Weather Satellite Report. In February's column we described the Woodhouse Communication specialty VHF antennas offered by James Buchanan, K8WPI. We discussed the Pro Line and Pro Line+ VHF/UHF full-band antennas for simplex or repeater operation on 2 meters and 440 MHz. We noted the several satellite antennas offered for weather satellites in the 137 MHz range. We also noted Woodhouse's OUTbacker™ Resonance Guide, to help you with the task of tuning the "top stinger" on the OUTbacker OB-series all-band HF mobile antennas.

Recently we see that Jim has taken over publication of the *Weather Satellite Report*, previously published by Bob Myers. The purpose of the magazine is to promote interest in viewing the earth and atmosphere from space, relating to the disciplines represented in the APT, HRPT, and GOES satellites. All aspects of these disciplines are encompassed by *WSR* in articles, columns, publisher's notes, industry news, and other features.

WSR is published quarterly; domestic subs are $25, or $30 in Canada. For more information on *WSR*, application notes on APT satellite DXing, and details on products offered, contact Woodhouse Communication, P.O. Box 73, Plainwell, MI 49080-0073 (phone 616-226-8873; Internet <View2Earth@aol.com>).

How the Internet Works. Has your child come home to you from school asking the 1990s-style question, "How does the Internet work, daddy?" If so, you're probably hard-pressed to come up with a simple, understandable answer. It's sort of like trying to answer the question of how the stars got up there or trying to explain just why the sky is blue.

Anyway, if you've e-mailed, chatted, or FTPed online, ZD Press can help you discover graphically how all that Internet stuff works with their new book, *How the Internet Works.* Written by respected computer author Preston Gralla, the slick, 180-page book continues the

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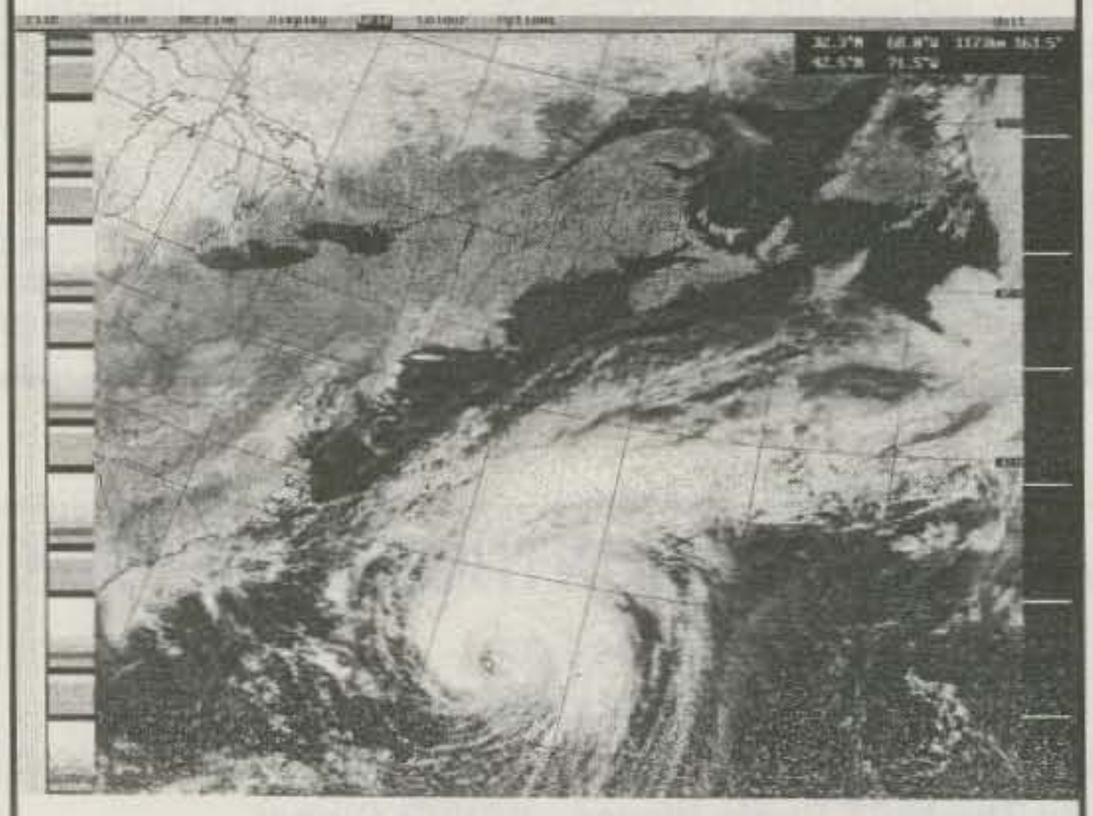

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"how it works" tradition he developed while at *PC/Computing* magazine. His book weaves full-color graphics and text into a technically rich but highly understandable presentation of very complex computer and Internet topics.

The book has chapters on what the Internet is, connecting with and communicating over the net, using Internet software tools, applying the Internet in practice, and safeguarding the net. While many topics addressed are technically advanced, the color graphics and clear language used make the subject matter understandable even to school-age youngsters.

The ZD Press book is $24.99 and is published by Macmillan Publishing USA, 8219 Northwest Blvd., Suite 400, Indianapolis, IN 46278 (telephone 1-800-858-7674; Internet <http://www.mcp.com>).

Short Bursts

More on RFI: Put Your Own House in Order First. If you've been following the column recently, you noticed we mentioned one or another aspects of radio frequency interference (RFI) for several months running, discussing FCC RFI policies and two books on RFI solutions. (The books were *Radio Frequency Interference: How to Find It and Fix It,* by Ed Hare, KA1CV, and Robert Schetgen, KU7G, ARRL, 1991; and *Interference Handbook,* by William Nelson, WA6FQG, and William I. Orr, W6SAI, Radio Publications, Inc./Radio Amateur Callbook, 1981.)

RFI is all around us, as it has been since the earliest days of radio. But as life becomes more complex, and technologically sophisticated devices and appliances fill our homes, the chance for interference becomes greater. Most cases of RFI can be cured, although success often is achieved only with some difficulty.

The best thing you can do as a radio amateur is to try to prevent RFI before it even starts by having a truly "clean" signal to begin with—one that's free of harmonics and other spurious emissions. Why? All licensed transmitters and stations must meet FCC specifications to prevent interference to other communications services. As you well know, you, the station operator, are responsible for proper operation of your equipment. This means getting your station wiring practices in order, ascertaining that equipment is in good condition and properly tuned, ensuring equipment shields and cabinets are in place, taking care that all gear is properly grounded, using an AC line filter in the equipment's power line, and perhaps using a lowpass or bandpass RF filter on the transmitter or transceiver. You also may have to relocate your antenna away from susceptible equipment and telephone or cable TV wiring.

The whole idea is for you to ensure that your own house is in order so you can honestly assert to neighbors that any RFI experienced is not the fault of your transmitting equipment. One of the best things you can do is to *first* apply RFI cures to *your own* consumer electronics gear before anyone complains. Doing so clearly underscores and demonstrates that you're able to operate your own transmitting equipment at the same time you use your own TV sets, radios, telephones, and other household electronic devices—without any interference to them.

Strictly speaking, radio amateurs aren't obligated to help consumers with RFI complaints that involve defects in, or improper operation of, *their* electronic equipment, although you may elect to do so in the interest of good neighborly relations. In coping with serious RFI situations, one of your first calls may be to your local volunteer American Radio Relay League (ARRL) Technical Coordinator (TC).

The TC is an experienced amateur who often has available to him several volunteer ARRL Technical Specialists who are particularly skilled at RFI resolution. The easiest way to contact your TC is to ask your ARRL Section Manager (SM) who your TC is; the SMs are listed (usually around page 10 or 12) in each issue of the ARRL's monthly journal, *QST.*

You also may find that your local radio club has an RFI or TVI committee that can help resolve interference problems. In some cases the committee may check out the suspected source (such as your station) for harmonics and spurious radiation, offer technical advice as needed, assist in obtaining RFI filters, and provide information to the individual consumer experiencing the RFI. Some committees have even launched publicity programs that keep the local community and its leaders aware of RFI problems, responsibilities, and possible cures.

If you're under the RFI gun, there are several RFI resources available to you. You may want to send for the ARRL "EMI/RFI Package." This free packet of information contains additional information and resources about RFI, including TVI and telephone interference. It's available from the Technical Department Secretary, American Radio Relay League, Inc., 225 Main St., Newington, CT 06111. Include a 9" × 12" SASE with three units of first-class postage and a request for the "EMI/RFI Package."

Detailed information about interference solutions also is found on the

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SL-11R-MC		•	7	11	5¾ × 7¼ × 9¾	13
SL-11R-GE	•		7	11	5¾ × 7 × 9¾	13
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13
SL-11R-EFJ		•	7	11	5⅛ × 7¼ × 9¾	13
SL-11MG		•	7	11	5⅛ × 7 1/18 × 9¾	13
SL-15R	•	•	12	15	2⅝ × 7 × 9¾	13
SL-15R-GE	•		12	15	5⅛ × 7⅝ × 9¾	14
SL-15R-RA		•	12	15	4¾ × 7¼ × 9¾	14
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RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty [Amps]	ICS* [Amps]	Size [IN] H × W × D	Shipping Wt. [lbs]
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 1	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

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VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	57	34	16	70	6 × 13¾ × 12½	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

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Internet's World Wide Web through the FCC Compliance and Information Bureau (CIB) home page. You can download the FCC's *Interference Handbook*, the electronic version of the FCC's *Interference to Home Electronic Entertainment Equipment Handbook*. A second useful RFI document you can download is their Telephone Interference Bulletin CIB-10, "What to Do if You Hear Radio Communications on Your Telephone." You will find both documents on the Internet at <http:// www.fcc.gov/cib/>.

Industrial Communication Engineers, Ltd. (ICE) offers a free set of some 18 one-page, easy-to-read reference technical publications. Several cover subjects related to ICE RFI and lightning-protection products. Topics of interest to RFI sleuths include: conducting noise audits (#10); grounding techniques (#31, #31A, and #32); grounding coaxial cable shields (#36); lowpass filters (#42); highpass filters (#43); telephone RFI (#46); and using antioxidants to maintain good interconnections (#60). For a complete listing of the free publications or to order a publication, contact Industrial Communications Engineers, Ltd., P.O. Box 18495, Indianapolis, IN 46218-0495 (1-800-423-2666).

Looking Back Five

Okay, so now you know what the column is like for March 1997. But what was "hot" in March 1992? That column was devoted mostly to the well-stocked amateur bookshelf and was called "Good Radio Reads."

We discussed Peter Dodd, G3LDO's book *Antenna Experimenter's Guide*; Peter Carron, Jr., W3DKV's *Morse Code: The Essential Language*; a resource guide, Walt Garrett, NØMAL's *HamStuff*, along with his "The Radio Channel" TV shows; and Carole Perry, WB2MGP's "Introduction to Amateur Radio" training program.

We also peeked at two books from Universal Radio, *Worldwide Aeronautical Communications Frequency Directory* by Robert E. Evans, and the *U.S.S.R. Merchant Ship List* by Jason Berri; several computer books from Osborne/McGraw-Hill and Brady/Simon & Schuster; Mike Callahan's *Shareware Magazine*; and the Van Valzah, Mirage/KLM, Grove Enterprises, and Radio Works amateur catalogs.

Turning to antennas, we described the NEO-12 series of monobanders from Leo D. Johnson, W3EB/VK5AFI; the "Ultra Gain" vertically polarized quad loops from Paul Smith, WB2NEM; marine-grade coax from Amateur Radio Specialties; and the Palomar Engineers PA-420 Channel Cleaner™ active antenna for SWLs. Software-wise, we covered Kevin A. Krueger, NØIOS's Marathon contesting software for the Apple Macintosh PC; Didah Publishing index software; and an update on the ON4UN Yagi Design package.

Wrap-Up

That's all for this time, gang. Next time more Antennas and Accessories topics of current interest. See you then.

Overheard: It's taken a long time to learn this, but now I know that if good advice is hard to give, it's even *harder* to follow.

73, Karl, W8FX

The station operator is responsible for interference from spurious signals he generates. We radio amateurs can reduce harmonic radiation by installing a lowpass filter at the transmitter. The lowpass filter, such as this representative ICE unit, allows frequencies up to a given cutoff frequency to pass through unattenuated to the antenna, while effectively shorting out harmonic radiation. See this month's column for a discussion of RFI considerations. (Photo courtesy Industrial Communication Engineers, Ltd.)

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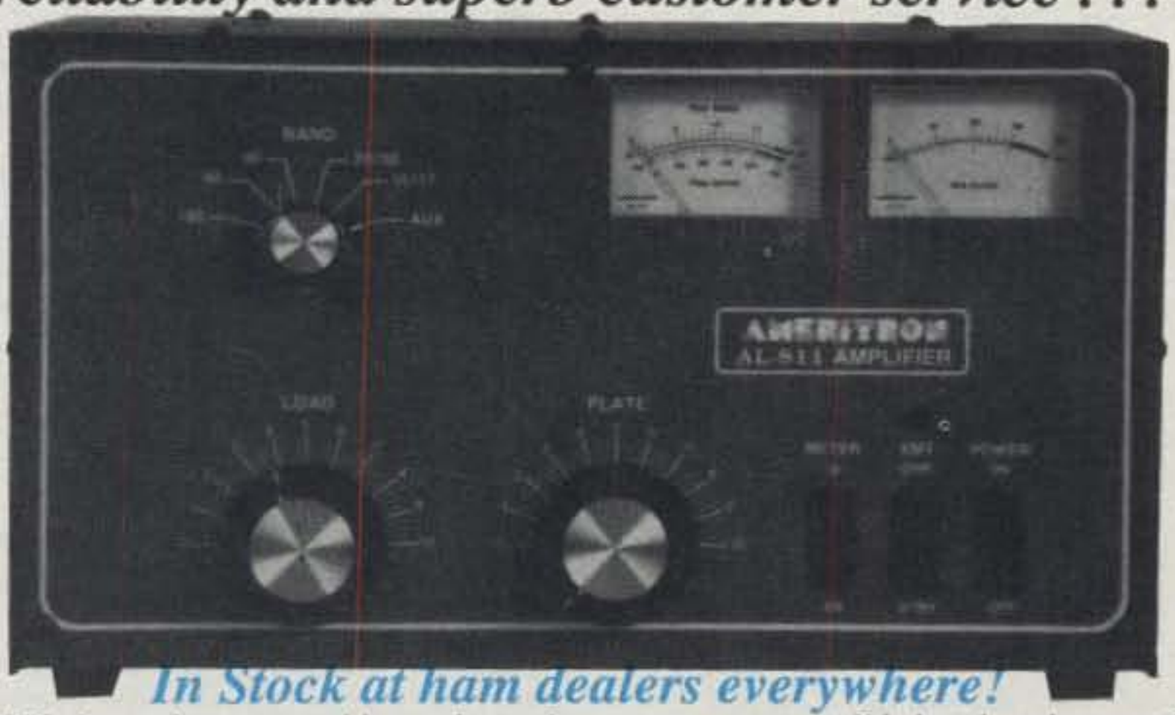

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CIRCLE 8 ON READER SERVICE CARD

BY JOE LYNCH, N6CL

VHF PLUS

ALL ABOUT THE WORLD ABOVE HF

Two Meter Band Plan Revision Proposal

In December Bill Tynan, W3XO, stirred up some thinking on the Internet with his proposal for revising the 2 meter band plan. Bill is the former editor of the "50 MHz and Above" column in *QST* and is president of AMSAT-NA. In light of the continuing threat of the Little LEO satellites, his ideas are worth thinking about. Originally appearing on the VHF reflector, Bill's proposal is reprinted here courtesy of him.

VHF PLUS CALENDAR

March 2	Last quarter moon. Very poor EME conditions.
March 8	New Moon.
March 9	Moon Perigee. Very good EME conditions.
March 15	First quarter moon.
March 16	Very poor EME conditions.
March 22-23	First leg of the DUBUS/REF EME Contest. (See text for details.)
March 23	Full moon. Moderate EME conditions.
March 25	Moon Apogee.
March 30	Very Poor EME conditions.
March 31	Last quarter moon.

**EME conditions courtesy W5LUU.*

Is It Time To Update The 2 Meter Band Plan?

By Bill Tynan, W3XO

Our 2 meter band supports many varied interests. FM, mostly through repeaters, is certainly the dominant mode, in terms of the number of people involved. Packet has come along in the past ten years and is probably the next most popular use of the band. There are, of course, several flavors of packet. There are the now traditional message handling and bulletin boards. There are also the very popular DX clusters. APRS is the newest form of packet which is gaining popularity rapidly. There is space work which includes both voice and packet communication through both unmanned amateur satellites and equipment installed on manned spacecraft—the U.S. Shuttle and the Russian MIR space station. There is also the weak-signal work characterized by SSB voice and by CW. It includes terrestrial work using various propagation modes, as well as Earth-Moon-Earth (EME). Almost universally, using present amateur technology, EME requires the use of CW.

Note that I did not include FM simplex voice. Not that there is none, but its use is not particularly widespread for any communication except very local, such as handhelds around hamfests. There are, of course, a few exceptions involving extended range simplex, but it is not as popular in this country as it is in Europe and Japan. In Japan all 2 meter work is simplex, as repeaters are not permitted on the band, although they are allowed on the higher bands. As a result, many JAs sport large side-by-side vertical 2 meter arrays for working as far as they can. There is also some 2 meter sideband work in Japan, but like here, FM is the dominant mode.

Another problem we face in this country is lack of communication and cooperation between those who adhere to single sideband and those who only use FM. As a result, the sidebanders are limited in the number of stations they can work, and the FMers are not exposed to what they could do with 2 meters if they would only forgo the repeater once in a while. They also seldom if ever participate in the kind of traditional hamming that many of us find so enjoyable. Repeater operation, while useful for carrying out communications generally over areas out to perhaps 30 miles from the repeater, is really not that much fun! In particular, many of the newer No-Code Technician licensees never find out that there is anything more to amateur radio than talking through the local repeaters. Even many more experienced hams have this view when it comes to any of the bands above 30 MHz.

As a result of the notion that FM repeater operation is all there is to VHF, and 2 meters in particular, many have purchased equipment limited to the FM mode. This fact has been identified by more than one as the reason for the failure of many of the non-code newcomers to advance into other kinds of amateur radio, or even to remain licensed after their original license expires. In this writer's opinion, a way must be found to inform people that traditional hamming does exist on the VHF bands, and that modes other than FM repeater operation do exist. A first step might be to encourage more FM simplex operation, and encourage it in such a way so as to encourage more traditional ham operating procedures rather than the "police and taxicab driver" kind of procedure so prevalent in many parts of the country on our repeater systems. One of the problems is that all of the designated FM simplex voice channels are in the higher portion of the band, between the repeater inputs and outputs. This provides only a few such channels in the mid-146 MHz region and a few more in the mid-147 MHz region. The fact that they are "channels" also puts them in very much the same category with respect to operating procedure as the repeater channels. The norm calls for short, directed calls. Seldom will you hear a "CQ." In fact, in many areas of the country anyone putting out a "CQ" on any FM voice channel is looked down on as a "lid," if those making the judgment even know what a lid is.

Before discussing a possible solution to this problem, let's look at the current 2 meter band plan as published by the *ARRL Repeater Directory:* The frequency allocation of 144.000–144.100 MHz is by FCC mandate reserved for CW. Of course the Band Plan reflects that. However, it designates 144.050–144.100 MHz as "General CW and weak signals." Actually, because of the great increase in the number using the mode, EMEers are currently occupying up to about 144.120. This permits them, when operating above 144.100, to switch from CW to SSB when signal levels warrant.

The frequency allocation of 144.100–144.200 is listed as "EME and weak-signal SSB," with 144.200 MHz being defined as the SSB calling frequency. The frequency allocation 144.200–144.275 MHz is listed as "General SSB operation." The frequency allocation of 144.275–144.300 MHz is defined as being for "Propagation beacons." This represents a change made a few years back when the FCC moved the mandated 2 meter beacon band from 144.050–144.060 to this current location.

The frequency allocation of 144.30–144.50 MHz is designated as the "New OSCAR subband." The frequency allocation of 144.50–144.60 MHz is listed as "Linear translator inputs." This, and its corresponding segment of 145.10–145.20 MHz, has seen almost no use for linear translators and is essentially universally used by conventional FM repeaters.

The frequency allocation of 144.60–144.90 MHz is listed as "FM repeater inputs." The frequency allocation of 144.90–145.10 MHz is stated in the Band Plan as designated for "Weak signal and FM simplex." It goes on to state that 145.01, 03, 05, 07, and 09 are widely used for packet radio. It is clear that also 144.91, 93, 95, 97, and 99 are also heavily used packet channels. The frequency allocation of 145.10–145.20 MHz is, as already noted, listed as "Linear translator outputs."

The frequency allocation of 145.20–145.50 MHz is quite properly listed as "FM repeater outputs." The frequency allocation of 145.50–145.80 MHz is listed as "Miscellaneous and experimental modes." It is clear that most of this is now widely used for packet nodes of various kinds, including DX clusters. Recently, 145.79 MHz has become the national APRS channel.

The frequency allocation of 145.80–146.00 MHz is correctly listed as "OSCAR subband." The frequency allocation of 146.01–146.37 MHz is listed as "Repeater inputs." There is a note which acknowledges the fact that some areas have a slightly different arrangement.

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For example, 146.40 MHz is a repeater input in some parts of the country.

The frequency allocation of 146.40–146.58 MHz is listed as "Simplex," with 146.52 MHz being the national simplex calling frequency. The frequency allocation of 146.61–147.39 MHz is listed as "Repeater outputs." The frequency allocation of 147.42–147.57 MHz is listed as "Simplex." The frequency allocation of 147.60–147.99 MHz is listed as "Repeater inputs."

There are several interesting notes attached to the Band Plan, as follows: "(*) Due to differences in regional coordination plans the simplex frequencies listed may be repeater inputs/outputs as well. Please check with local coordinators for further information. (1) Automatic unattended operations should be coordinated on 145.01, 145.03, 145.05, 145.07, and 145.09 MHz. (a) 145.01 should be reserved for inter-LAN use. (b) Use of the remaining frequencies should be determined by local user groups. (2) Additional frequencies within the 2 meter band may designated for packet radio use by local coordinators. Other notes follow concerning packet and the fact that some areas use 15 kHz splits for FM channels, while others use 20 kHz splits."

What Changes are Needed and Why? First, I believe that the 2 meter band plan should be brought up to date to reflect current use as closely as possible. If a "band plan" that does not reflect current use is published year after year, its validity becomes questionable and it loses all effectiveness.

For one thing, since there are no terrestrial linear translators, and because of existing FM repeater coordinations none are likely in areas of the country where they might be expected to be built, let's do away with that provision in the band plan. There may be other provisions of the 2 meter band plan that are ripe for changing, but I am not competent to address these. These can be best examined by the ARRL Spectrum Management Committee. For example, there have been recent proposals floated to add additional packet channels.

As noted above, for some years 144.3–144.5 MHz has been designated as the "New OSCAR subband." This segment was used in the Mode J transponder in OSCAR-13. However, such use ran into a lot of opposition in Europe where the entire lower 500 kHz of the 2 meter band is used for SSB and CW weak-signal work. The Europeans objected strongly to this application, fearing that stations trying to work through the satellite in this frequency range would interfere with weak-signal terrestrial and EME operation. For that reason, the segment is not expected to be used for wide-band satellite transponders in the future. Nevertheless, it is used for other space applications. Many of the command links for existing satellites are in that part of the band. In addition, 144.45 and 144.47 MHz are being used for voice uplinks to the SAREX equipment on the Shuttle and 144.49 MHz is used as a packet uplink. So the 144.3 to 144.5 MHz segment does remain in use for space applications.

Nevertheless, the segment can probably support other kinds of operation as long as they are not high-use activities, as repeaters and many packet nodes tend to be. In areas of high population density, such stations are often on the air almost continuously, whereas casual individual use tends to be less intensive, providing an opportunity to share, particularly the spacecraft command application, with other uses.

Therefore, one important aspect of how I propose the 2 meter band plan to be changed is that 144.3–144.4 be designated as a non-channelized mixed mode, specifically including FM simplex voice. As it is today, it can still be used for SSB when the need arises, such as for skeds during major meteor showers. It can also be used for the occasional AM operation still present in some parts of the country, mostly around 144.4. Such use offers a number of advantages:

(1) FM voice simplex work is encouraged.

(2) Such FM simplex work will be established closer to the portion of the band used for SSB and CW work, where people try for extended range and DX and generally employ "traditional" amateur operating procedures. Having the two modes closer together will enable a type of "cross fertilization." Sidebanders, who almost all have FM radios, will be encouraged to tune above 144.3 and work the FMers, particularly during times of enhanced propagation or whenever they run out of sidebanders to work. This arrangement should work particularly well during VHF contests. Those with only FM equipment can be encouraged to get on during contests and actually participate in them.

Currently what happens is that the big contest stations invade the few simplex channels (except for 146.52, which is off-limits for contest operation during the three major ARRL contests). Often the FMers these big contest stations snag are casual operators who may not even know that a contest is in progress.

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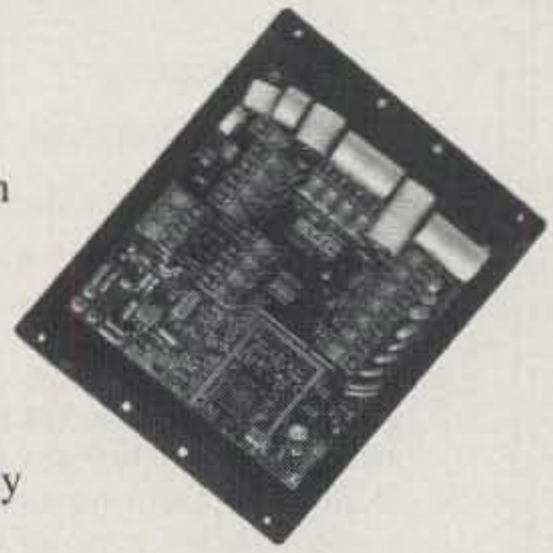

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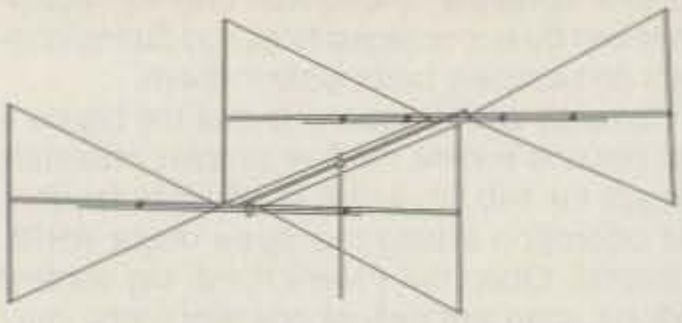

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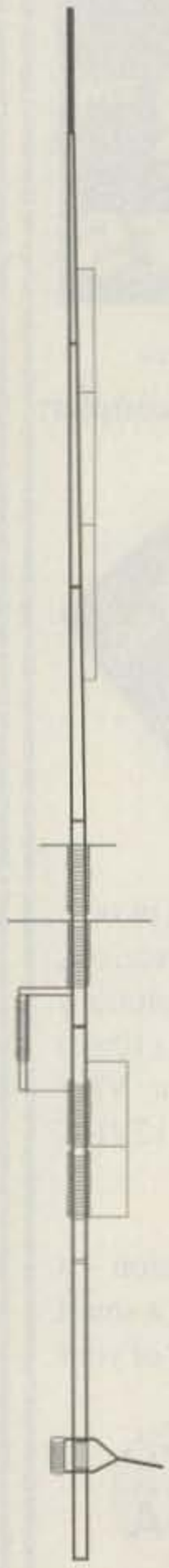

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Whether or not they know about the contest and wish to try their luck, they are usually limited to working a few of the "big guns" who keep the limited number of channels tied up for most of the contest.

(3) FMers operating in this proposed non-channelized segment of the band will have the chance to experience real hamming, where it is not a sin to call CQ and ten codes are not heard, but Morse Code might be!

(4) Having the modes closer together will facilitate sidebanders switching their radio to FM and venturing into the segment. Their antennas will perform better there than they do above 146 MHz and tube amplifiers will not require much if any re-tuning. The fact that FMers usually use vertical antennas and sidebanders use horizontal antennas does present a problem, but it does not prevent communication altogether.

(5) As a result of the cross fertilization, many FMers will find out how much more can be worked on sideband and how much fun real hamming is. As a result, they are more apt to acquire sideband equipment next time around, and perhaps even turn their antennas over.

What do you think? Talk about this idea at your club and with your 2 meter friends. If you think it has merit, start encouraging FM operators in your area to begin using the 144.3 to 144.4 MHz segment on a non-channelized basis. I am told that some such operation already takes place in this segment of the band in some parts of the country, New England in particular. Also, contact the ARRL and suggest that the 2 Meter Band Plan be revised to reflect this use and generally bring the Band Plan into line with current usage. Any such action may take a while, as the League must go through an established procedure before Band Plan changes can be made official. But there is no reason why we can't begin to use the 144.3–144.4 MHz segment for non-channelized FM simplex voice operation right away.

Phase 3-D Satellite Now Set for July Launch

The following is from an AMSAT press release: "Phase 3-D Launch Now Set for July 1997," Silver Springs, MD (AMSAT News Service)—A published report released on Tuesday, December 17th by the European Space Agency (ESA) has shed new light on the planned launch date for AMSAT's Phase 3-D international satellite aboard the next flight of the Ariane 5 booster, Ariane 502.

Following a plan of action set in motion last September among ESA, the French Space Agency (CNES) and the firms concerned in building the rocket, a detailed timetable for operations leading up to Ariane flight 502 has now been established by these organizations.

ESA reports that while each individual operation will require very close analysis, the Ariane 502 launch campaign is now scheduled to begin on Wednesday April 9, 1997, with the launch itself now planned for early July.

Given these dates, the last qualification launch of the Ariane 5, Ariane 503, managed by ArianeSpace, has now been scheduled for November 1997.

AMSAT-NA President Bill Tynan, W3XO, welcomed the news saying that, "It gives us a definite goal to shoot for in our preparations of the Phase 3-D spacecraft. However, every month the launch is pushed back means more funds are needed." Bill noted that a letter is currently going out to all AMSAT-NA members asking for additional contributions to the project. He emphasized, "It is particularly important to the successful completion and launch of Phase 3-D that recipients of this letter respond as generously as they can."

AMSAT is a not-for-profit, 501(c)(3) educational and scientific organization that was first chartered in Washington, DC. Its objectives include promoting space research and communication by building, launching, and controlling amateur radio spacecraft. Since its founding, over 25 years ago, many other like-minded organizations have been formed around the world to pursue the same goals, and now also share the AMSAT name. Often acting together, these groups have used predominantly volunteer labor and donated resources to design, construct, and, with the added assistance of government and commercial space agencies, successfully launch over two dozen amateur radio communications satellites into Earth orbit.

The Phase 3-D satellite, now under construction with the help of over a dozen AMSAT groups on five continents, will be the largest, most complex, and most expensive amateur radio satellite ever built.

For more information contact: *In North America,* AMSAT-North America, Keith Baker, KB1SF, Executive Vice-President, 1324 Fairgrounds Road, Xenia, Ohio 45385-9514 USA (phone/fax 513-429-5325; Internet <kb1sf@amsat.org>). *In Europe,* AMSAT-Germany, Werner Haas, DJ5KQ, Vice-President, Holderstrauch 10, D-35041 Marburg, Germany (phone [06421] 684121; fax [06421] 285665; Internet <dj5kq@amsat.org>).

FCC Delays Implementing RF Safety Regulations

The following is from the FCC's home page: FCC extends transition period for determining compliance with new requirements for evaluating the environmental effects of RF electromagnetic fields from FCC-regulated transmitters (et docket no. 93-62).

The Commission has amended its rules to extend the transition period for applicants and station licensees to determine compliance with the new requirements for evaluating the environmental effects of radio-frequency (RF) electromagnetic fields from FCC-regulated transmitters.

In 1985 the Commission adopted rules for evaluating the environmental effects of RF electromagnetic fields produced by FCC-regulated transmitters. In August 1996 the Commission amended those rules by provided for the use of new guidelines and methods, and established a transition period, until January 1, 1997, for applicants and stations to come into compliance with the new requirements.

The American Radio Relay League, Inc., Ameritech Mobile Communications, Inc., AT&T Wireless Services, Inc., BellSouth Corporation, Paging Network, Inc., the Personal Communications Industry Association, and US West filed petitions asking the Commission to extend the transition period beyond January 1, 1997, arguing that the existing transition period failed to provide adequate time for affected parties to achieve compliance with the new rules.

The Commission stated that based on the petitions and comments, it is clear that most station applicants will need additional time to

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determine that they comply with the new requirements. The Commission noted that an extension of the transition period would: (1) eliminate the need for the filing and granting of individual waiver requests; (2) allow time for applicants and licensees to review the results of the decisions that will be taken in the near future addressing other issues raised in petitions; and (3) permit applicants to review a revised information bulletin and make the necessary measurements or calculations to determine that they are in compliance.

The Commission indicated that it did not concur with petitioners who suggest that granting any extension of the transition period will have significant adverse effects on public health.

Therefore, the Commission has extended the transition period to September 1, 1997 for most radio services. For the Amateur Radio Service the transition period has been extended to January 1, 1998. Additionally, the Commission will allow changes to amateur radio operator license examinations to be made as the examinations are routinely revised between now and July 1, 1998.

The Commission believes that these extensions are necessary so that applicants and licensees will have adequate time to understand the new requirements and to ensure that their facilities are in compliance with them.

Action by the Commission December 23, 1996, by First Memorandum Opinion and Order (FCC 96-487). Chairman Hundt, Commissioners Quello, Ness, and Chong.

News media contact: Patricia A. Chew at 202-418-0500. Office of Engineering and Technology contact: Rick Engelman at 202-418-2445 and Robert Cleveland at 202-418-2422.

Guatemala Revokes Amateur 70 cm Privileges

The following is from various Internet sources. This editor obtained it from the KH6FOO home page (www.aloha.net/~ratech/kh6foo). It is also available on HamRadio Online (http://www.hamradio-online.com):

70 cm Band Loss in Guatemala: By "Space News," published by John Magliacane, KD2BD ("SpaceNews" is available online at <http://www.amsat.org>, the AMSAT web site):

Manfred, TG9IKE, reports that all UHF and SHF bands will soon be lost to commercial interests in Guatemala. On Monday, November 18, 1996, the Diario de Centro America published the new law regulating all telecommunications in Guatemala, Decreto Numero 94–96, Congreso de la Republica.

The law divides the electromagnetic spectrum into three areas: bands assigned to amateur radio, bands reserved for government use, and the remainder as regulated bands the frequencies of which be auctioned off to the highest bidder for a term of 15 years. Paragraph 66 contains the listing of the amateur bands to be used in Guatemala after January 18, 1997. All shortwave bands are preserved. The higher band assignments are as follows: 50–54 MHz, 144–148 MHz, 24–24.05 GHz, 47–47.2 GHz, 75.5–76 GHz, 142–144 GHz, 248–250 GHz.

Up to now the 70 cm band in Guatemala, for which some licenses have been issued in the past, comprised the frequencies between 430 and 440 MHz. This range has now been declared available for commercial use.

The new law was created by a commission from the state-owned telcommunications company GUATEL, which consulted the Radio Club of Guatemala about the project. The commission was quite astonished to learn that amateur radio operators operate some 20 satellites for global communications, and on request Guatemalan amateurs supplied a list of amateur satellites with operating frequencies and modes. The existence of the Amateur Satellite Service was also brought to the attention of the CEO of GUATEL and the chairman of the committee of congress in charge of the compilation of the new telecommunications law in personal meetings, presenting related IARU and ITU documentation.

Possible interference from satellite-based transmitters in the 70 cm band for commercial users in Guatemala may not be so severe, considering the low signal levels. However, there may be heavy interference to the Amateur Satellite Service when the transponders pick up commercial signals and rebroadcast them on other bands. Even for low-orbiting satellites this will affect an area from southern Canada, through all of the USA, Mexico, and Central and South America down to Chile and Argentina. Taking into account the future operations of P3D, the situation may be even worse.

While looking deeper into this matter, Guatemalan amateurs learned that the 70 cm band is assigned for amateur use on a secondary basis. It remains uncertain whether the satellite subband from 436 to 438 MHz is an exclusive assignment or not, and whether the state of Guatemala has signed an ITU document concerning the use of bands for the Amateur Satellite Service.

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The new telecommunications law contains provisions for reassigning frequencies to the amateur service if required by international treaty, so there still remains a chance that at least the 70 cm band can be saved if the amateurs of Guatemala can present a legal proof to their government. Any information regarding this matter should be directed to the Radio Club of Guatemala at the following address: CRAG (Club de Radio Aficionados de Guatemala), Apartado Postal 115, Ciudad de Guatemala, Guatemala, Centro America (phone/fax 00502-331 4683).

AMSAT organizations are also asked to consider this matter and take whatever measures necessary to preserve the 70 cm band for non-commercial, amateur use to avoid interference to OSCAR spacecraft. Any statements of concern about the effects of the new telecomunications law of Guatemala should be addressed via diplomatic conduct (Guatemalan Embassy in your country) to: Ing. Fritz Garcia-Gallont, Ministro de Comunicaciones, Transportes y Obras Publicas.

Information for this article was obtained from Manfred Kolbe, TG9IKE, e-mail <mkolbe@pronet.net.gt>.

Comments and input for "SpaceNews" should be directed to the editor (John, KD2BD) via any of the following paths: <http://www.njin.net/~magliaco/>; packet <KD2BD@ KS4HR.NJ.USA.NA>; Internet <kd2bd@amsat.org> or <magliaco@email.njin.net>; via amateur satellite AMSAT-OSCAR-16, LUSAT-OSCAR-19; or phone 908-224-2948, fax 908-224-2060.

Current Contests

DUBUS/REF: The first leg for 144 and 1296 MHz is the weekend of 22–23 March, and the second for 432, 2300 MHz and up is 12–13 April. The following is a reprint of last year's rules as posted on the Internet.

European EME Contest: Sponsored by REF and DUBUS, this contest is intended to encourage worldwide activity on moonbounce. Multipliers are DXCC countries plus all W/VK/VE states. *Note:* This multiplier is new this year. The change is intended to give equal chances for stations from North America, Europe, and Oceania. The rules reward random QSOs, but do not penalize skeds on 2.3 GHz or above.

Contest Dates & Periods: The contest takes place during two full weekends—144 and 1296 MHz on the first weekend, and 432 MHz and all other bands on the second weekend. Each leg of the contest begins at 0000 UTC on Saturday and ends at 2400 UTC on Sunday.

Bands and Dates: First leg—144 MHz and 1296 MHz, 22–23 March 1997. Second leg—432 MHz, 2300 MHz and above, 12–13 April 1997.

Categories: QRP—144 MHz, <100 kW EIRP; 432 MHz, <400 kW EIRP; 1296 MHz, <600kW ERP; >= 2300 MHz, no separate QRP/QRO categories. QRO—EIRP equal to or greater than stated above. PRO—Non-amateur equipment or antenna. PRO stations will not be ranked.

Exchange: Callsigns, TMO or RST.

Scoring: 100 points for each random QSO completed; 10 points for each sked QSO completed on bands below 2.3 GHz; 100 points for each sked QSO completed on 2.3 GHz or higher bands.

Multipliers: Each DXCC country (except W/VE/VK), plus *each individual state* worked in W/VK or province worked in VE. Multipliers count only if worked by *random* (except on 2.3 GHz or above). States and provinces can be determined after the contest using address lists in recent newsletters or in DUBUS.

Total per band: Sum of points multiplied by sum of multipliers.

Final score for multiband entries: (Total sum of points on all bands) * (total sum of multipliers on all bands).

Classifying: Top score defines one winner per band and one for multiband class. Multiband stations will also be classified on each separate band worked. There are no separate multi-operator classes. Multi-operator and QRO stations will be highlighted in the general classifications.

Reporting: Copy of the log for each band with details on points, multipliers, and total points. The following info *must* also be included:

(1) Output power, transmit cable loss, antenna type, and gain.

(2) Working category: QRO/QRP, mono/multi operator.

(3) Name(s) and signature(s) of all operators

(4) Locator/state.

Other information is welcome—comments, conditions, grid locator, station details, photographs, etc.

Awards: A certificate will be sent to each entry. All (multi-)band winners will receive a trophy.

Logs: Log entries *must* be postmarked no later than 30 days after the end of the second leg (i.e., in the mail by 9 May) to the following: DUBUS Verlag EME Contest, P.O.B. 500368, D-22703 Hamburg, Germany (fax [++49]40-8508972; e-mail <dubus01@ibm.net>).

Responsible for rules and general questions is Ian White, G3SEK, 52 Abingdon Road, Drayton, Abingdon, Oxon OX14 4HP, England (phone [++44]1235-531559; e-mail <g3sek@ifwtech.demon.co.uk>).

Good luck in the contest! For REF: Philippe Martin, F6ETI; for DUBUS: Rainer Bertelsmeier, DJ9BV.

Alaska on 23 cm

The following is from the "432 MHz and Above EME Newsletter": Bill, NL7F, reports activating Alaska on 23 cm EME. Quoting Bill, "My first contact was a random on 21 December at 0210 UTC with N2IQU (439/429). To the best of my knowledge this is the first ever two-way contact with Alaska on 23 cm via any path. *[Newsletter editor Al Katz, K2UYH, adds: "I believe this is indeed the case!"]* On 22 December stations worked on schedule were SM2CEW, W2UHI, and K2UYH. I have 350 w at feed of 3.7 m dish. I am interested in skeds. My e-mail is <wbeam@polarnet.com>."

Current Conferences

The Southeastern VHF Society has announced its Inaugural Conference to be held in Marrietta, Georgia, April 4–5 1997. Following are some excerpts are from their press release:

"We are currently planning our program, which will include technical presentations at various levels of expertise, noise figure and antenna measurment, a beginner's forum, banquet, prizes, and family programming.

"The conference location will be the Marriott Hotel at Windy Hill in Marrietta, Georgia. The hotel rate will be $69.00 per room for single or double occupancy. For reservations, call the Marriott at 1-800-228-9290. For commercial air

transport, Atlanta-Hartsfield Airport is about 45 minutes away by Atlanta Airport Northside Shuttle. The hotel is also equidistant from three local airports for private aircraft.

"Jimmy Treybig, W6JKV, will be the conference banquet speaker on Saturday evening. Jimmy is the founder and past president of Tandem Computers and one of the world's leading experts on 50 MHz propagation. Other programs include: Six Meter EME Arrays by Bob Magnani, K6QYX; System Noise Reduction Techniques by Bob Striegl, KA2DRH; Digital Television Techniques by Mike Combs, KM4YW, and Ned Fountain, WC4X; Down East Microwave Clinic by Steve Kostro, N2CEI; 4CX1600 Cavity Amplifiers by Steve Gross, N4PZ; SETI: The Search for Life Continues by Paul Shuch, N6TX; TVI Suppression with Filters by Reed Fisher, W2CQH; VHF-EME DXpeditions by Jimmy Treybig, W6JKV; Large Yagi Array Matching by Ray Rector, WA4NJP; 432 MHz and Up: What Can You Expect? by Charles Osborne, WD4MBK; Doppler Shift Airplane Scatter by Charles Osborne, WD4MBK; VHF/UHF Weak Signals for Beginners by Jim Worsham, WA4KXY; and 3CX800 Six and Two Meter Amplifiers by Pat Stein, Command Technologies.

"Antenna Measurement will take place at the Georgia Tech Research Institute (GTRI) antenna measurement range on Friday, April 4th. Two meter through 903 MHz antennas will be measured Friday morning, and 1296 MHz and up Friday afternoon. Pattern plots will be available to the top finishers in each band!

"Noise Figure Testing will be available for 6 meters through 20 GHz on Saturday, April 5th. Attendees will be assigned a time on Saturday when their registration is received. Remember to indicate on your conference registration form the item(s) you will bring for measurement. This will ensure you a time slot. The measurements chairman is Charles Osborne, WD4MBK, <cosborne@pipeline.com>.

"Also included will be shack tours of some impressive stations, and a CNN tour family program on Friday and SciTrek program Saturday.

"A registration form for the conference can be obtained by logging on to the Southeastern VHF home page (www.akorn.net/~ae6e/svhfs) or by contacting Jim Worsham, WA4KXY, 1997 Conference Chairman, at his e-mail address: <jimworsham@bellsouth.net>."

And Finally . . .

Threats to the VHF+ amateur bands continue unabated into this year. As you have read, this month's column reports on some of them. It is imperative that we do everything we can to both occupy the bands and present a united front to the opposition. Unfortunately, I continue to come across petty bickering both on the air and on the Internet. If we expect to impress our opposition, we certainly cannot do so by presenting them with disunity. Time and again throughout history the conquered have made it so much easier for their opposition by initially becoming divided among themselves. Let's pull together and stay together for our future's sake. If not, very soon we all could be on the Internet, reflecting on the way things were in the "good old days" of the 1990s.

This is all for this month. Thanks again for your support for this, your column. Until next month . . .

73, Joe, N6CL

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CIRCLE 54 ON READER SERVICE CARD

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

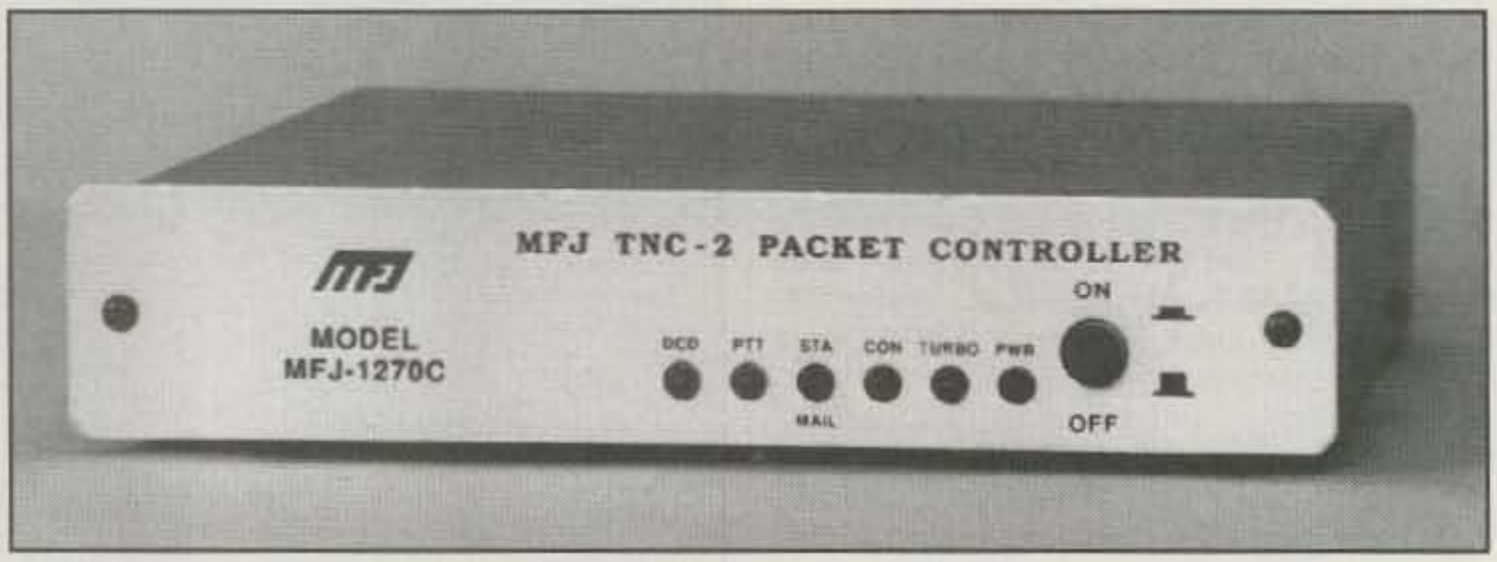
Let's Talk Packet Radio

I've received tons of e-mail asking about what to do, where to connect, what kind of antenna to use, how to interface TNC "A" to transceiver "B." This list goes on—for awhile. Shortly after the first day of 1997, my e-mail jumped from (Did I say jumped? It *shot!)* from around 100 e-mail messages a week to over 300 a week. I guess someone sold a lot of terminal node controllers (TNCs) and many of you received TNCs for Christmas.

Quite a number of the questions I'm receiving relate to the "new language" used with packet radio. Many of you now realize the ease with which you can begin to operate the digital modes. It's so effortless that most newcomers find they delayed getting into packet radio for no real reason.

In the next few issues I'll answer some of the questions I've received via e-mail. Keep your eyes on this column so you won't miss the answers you've been looking for. I will continue to answer the e-mail questions via the e-mail. However, there are many who don't have e-mail access, and you too may need an answer to a similar question. For those who need answers about packet via the postal service, my address is at the bottom of this page. Be sure to include an SASE for the return answer, and watch this column each month for other packet information.

In addition to answering your questions, beginning this month I will present a glossary of the terms used in "packetese." This will continue for several months, so keep those issues handy for future reference.



The MFJ-1270C TNC-2 packet controller.

The VHF Packet Radio Doorway

The new packeteer finds a doorway to the digital modes through packet. The doorway is almost always (at least 85% of the time) at VHF. Since VHF is where 85% to 90% of the new packeteers begin their packet hobby, this is where we will begin this month.

The TNC interfaces to the 2 meter rig via three lines. Transmit audio (AFSK) is fed from the terminal node controller to the radio microphone input. Receive audio is fed to the TNC audio input from one of the following sources:

1. The receive discriminator.
2. The receive detector.
3. The speaker output (most used source).

The third line is the push-to-talk (PTT) line from the TNC, which provides automatic control of the transmit and receive function when a packet is sent from the TNC. This control is activated when a carriage return is issued or when the PACLen is reached. This action can occur when the TNC is in either the CONVers or the Transparent mode.

Protocol

The primary consideration is that our TNC supports AX.25 Level 2, Version 2 Protocol. Most TNCs have a command called AX25L2V2. In the older TNCs this command is usually defaulted to OFF, but in the late-model TNCs you will find that it is now defaulted ON. When you begin configuration of your TNC, this should be one of the first commands that is set to ON.

The second consideration relates to the kind of computer or terminal you are using. All TNCs support an RS-232 terminal interface. Later on in the year I will explain the RS-232 signal format more fully.

The Digital Vocabulary and The Buzz Words of Packet

Now that you're on the air, as a new packeteer you are confronted with buzz words, mnemonics, and acronyms that often are alien to you. In the text that follows I'm providing a glossary to help you overcome the confusion sometimes associated with what I call "packetese." It is necessary that you become acquainted with the language if you are going to understand what is being said.

Although the words that follow are explained in the glossary, there are some abbreviations that need to be understood before we progress beyond this introduction.

Such is the case of the acronym used to indicate the command state of the TNC. The acronym is a simple "cmd:" which appears on the display when the TNC and terminal are set to the correct baudrate, data word length, and parity. cmd: denotes that the TNC is in the COMMAND state and is ready to receive input from the terminal.

We soon will learn the difference between the COMMAND (cmd:) and the CONVERSE (CONV) mode. In the COMMAND mode you are talking to the packet controller and anything you type is interpreted as a command by the packet controller (TNC). In the CONVERSE mode you are talking to the packet world and anything you type is converted into packets by the TNC. If your transceiver is ON, it is transmitted over the air as a packet of data every time you press the <Enter> key or carriage return (C/R).

If you have entered the CONVERSE mode, it is necessary that you go into the COMMAND mode so you can communicate with the packet controller (TNC). To get into the COMMAND mode, type CRTL-C (holding the control key down while momentarily pressing the "C" key). You will know you are in the COMMAND mode when you see the familiar TNC prompt "cmd:"

If you are in the COMMAND (cmd:) mode and you wish to go into CONVERSE mode, at the "cmd:" prompt type CONVERSE (or CONV for short). Many TNCs permit the use of the "K" key to enter the command (cmd:) mode. This too will take you directly to the CONVERSE mode without typing CONV.

Many packet terminal programs for the PC or compatible will use the F1 and F2 keys to enter the COMMAND (F1 = cmd:) and CONVERSE (F2 = CONV) modes, thus reducing the command key input to only one keystroke. Remember: When you want to change or modify a command in the TNC, you must be in the COMMAND (cmd:) mode.

Reading the manual that comes with your packet controller (TNC) is helpful in learning the first necessary lesson involved in setting the commands within the packet controller. Realizing there are sometimes over 100 commands in a TNC, you soon learn there are also just as many ways to configure the TNC. It is my responsibility here and now to inform you that in no way, shape, or form are you to try to recall from memory every command for your TNC. As a matter of fact, there are only five or six parameters that need to be set in a new TNC. With the exception of your callsign, the bulk of the commands are defaulted to the correct setting.

Later I'll assist you in the understanding and use of the TNC commands. For now, though, let's get acquainted with how I set up and use a few parameters in my TNC.

It will be up to you to read the manual that accompanied your TNC and fine-tune it as you use your station. As you become familiar with

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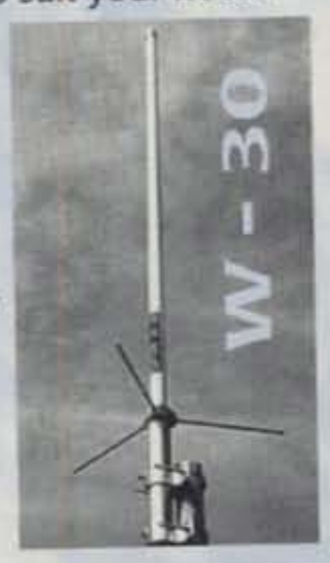

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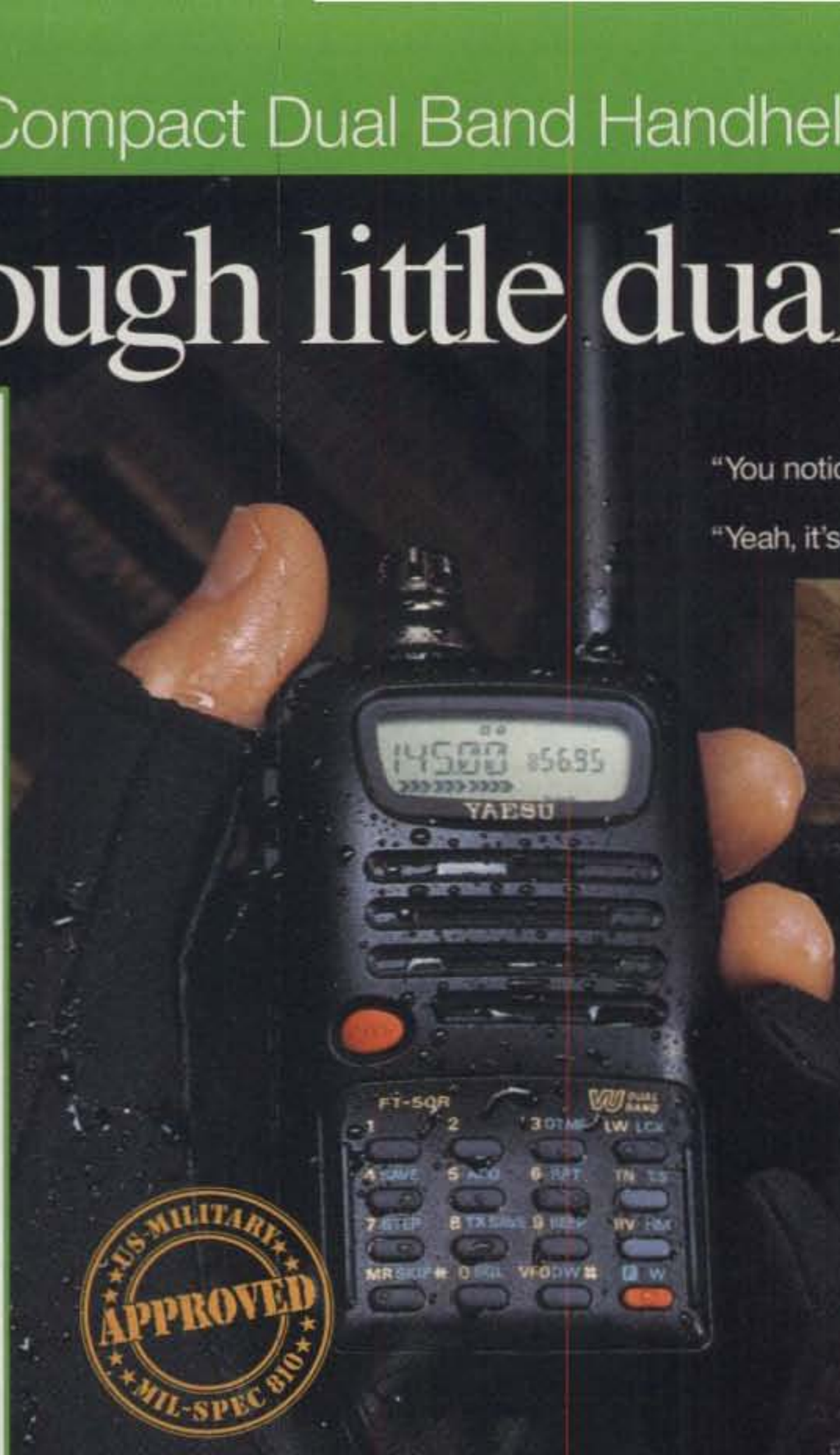

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your TNC, you may discover better ways to configure your TNC, allowing you to customize your system requirements.

Learning "Packetese"

As soon as I have the terminal talking to the TNC, I set "MYcall K4ABT." If I'm using the PC or compatible with a split-screen terminal program, I set "ECHO OFF" unless the DUPplex in the terminal program is set to "FULL."

I prefer an ABaud (terminal to TNC baudrate) to be set as high as the PC will handle. At best, I will not use a baudrate below the HBaud (TNC to RADIO baudrate). A rule that we try to maintain is to set the ABaud at least equal to, or greater than, the HBaud. This allows the terminal buffer(s) to keep the TNC buffers clear of incoming data. A word of caution for those who like to read the scrolling screen. If the ABaud is too high and the data flow coming in is from a BBS with a long PACLen, you may find it difficult to read the scrolling screen. The best way to handle this is to let the data flow into the buffer and save it to disk. Later you will be able to print it, or "page" through it in a text editor.

Many computer terminals maintain an internal handshaking that does not allow the screen to scroll fast. If this is the case with your terminal and if you are running an HBaud of 2400 BPS, then by all means use an ABaud of 2400 minimum.

Following is the beginning of a glossary of many of the terms of "packetese." These definitions should answer many of your questions and clear up some of the confusion.

Glossary of Packet Terms

AAR (Automatic Alternate Routing): Provision or function in a network to obtain a connection via secondary routes between two locations without need for user intervention. Compare to TheNET X-1J4 nodes.

ABaud: (In some terminal node controllers this is called "TBaud.") Data speed between the computer terminal and the TNC.

ACK: Acknowledgment from target packet station receiving an error-free packet from the station which sent the original packet of information. The "acknowledge" character in many data codes, ACK is used most commonly for an affirmative response of correct receipt (as opposed to NACK). The ACK lets the sending station know if it should send another packet or resend a missed or NACK (defective) packet.

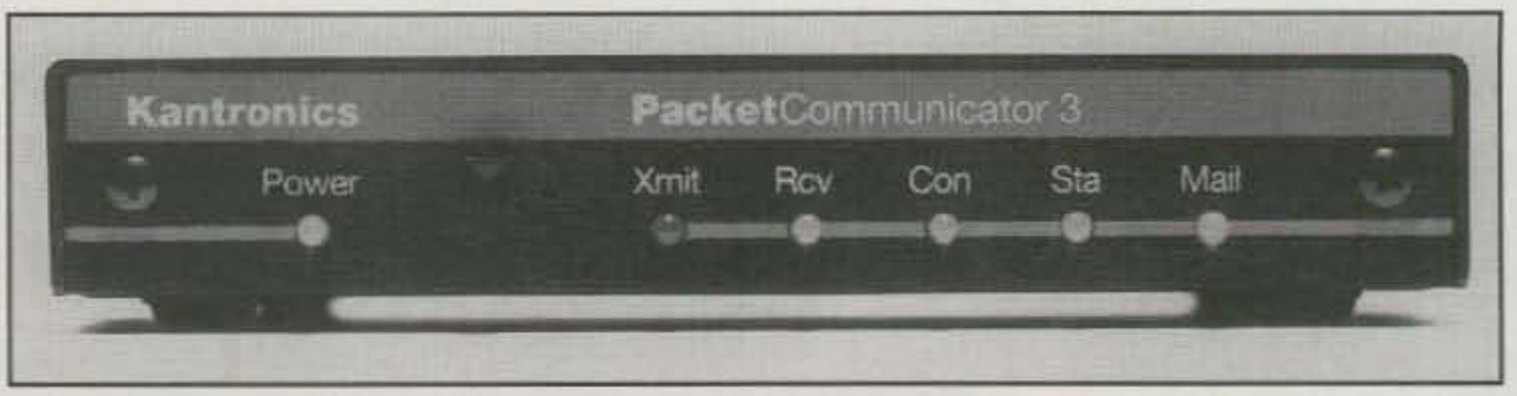
ADDRESS: In packet radio networks, the distinct identifier of a destination node or station.

AEA: Advanced Electronics Applications Inc. AEA designed, manufactured, and marketed a wide range of amateur packet products as well as other amateur related items (now out of business).

AFSK: Audio Frequency-Shift Keying. A method of digital modulation. This is a mechanism for sending digital information over a radio. A signal 0 (zero) is sent using one tone, while the signal 1 (one) is sent using a different tone. This is the mechanism used by telephone modems and packet radio modems. When associated with VHF packet, the audio frequency-shift is usually 1000 Hz. A 0 (zero) is one tone while a 1 (one) is a different tone.

Algorithm: A prescribed set of steps that implement a function or task. A mathematical solution.

Alias: The alias is normally used to identify the location of a digipeater. Many nodes are given the local airport identifier or the abbreviation for the city or state of origin—i.e., the alias of the Lynchburg, Virginia SEDAN node is "LVA." The alias also eliminates the need to type in long callsigns and SSID.



The Kantronics KPC3 TNC.

Aloha Net: An early (1975) packet radio experiment conducted by the University of Hawaii. The Aloha net is known for its performance definitions for packet systems which have hidden transmitters.

Alternate Route: A secondary communications path used to reach a destination if the primary path is unavailable.

AM (Amplitude Modulation): Modifying a "carrier" signal by varying its instantaneous power to represent the information it carries; most commonly called "AM."

Ambient Noise: Constant noise present in all forms of telecommunications paths; a condition with which most packet communications networks operate.

AMRAD (Amateur Radio Research and Development Corp.): A non-profit group based in Virginia that has promoted many of the present-day guidelines and practices that affect Packet Radio. AMRAD is one of the first organizations that was established to advance packet radio communications.

AMTEX (AMtor TEXt): A bulletin broadcasting system used by AMTOR bulletin stations such as W1AW. Similar to the US Coast Guard NAVTEX system of naval advisories.

AMTOR (AMateur Teleprinting Over Radio): An improved method of RTTY that uses some forms of error recognition and correction to improve copy. Sort of a very simple basic form of packet using three character groups. AMTOR uses a limited character set (capital letters, numbers, and a couple of controls such as CR/LF—similar to the Baudot set). AMTOR normally is used on HF frequencies. It is modeled on a commercial protocol called SITOR. *(See also ARQ, FEC, SITOR, FACTOR, RTTY, Baudot.)*

Analog Signal: A signal in a form that varies in step with the actual transmitted information. The retransmitted analog signal is not always an exact replica of the input.

ANSI (American National Standards Institute): Official repository of standards for the United States. Example: ASCII data communications code is ANSI C.64 and CCITT International Telegraph Alphabet Number 5, with only the smallest variation in a few definitions.

Application Layer: The topmost, visible to the user presentation of a communications network. The user level of packet radio (AX.25) is Level 2.

APLink (AMTOR Packet Link): An AMTOR BBS program written by Vic, W5SMM, and used on an IBM PC to operate an AMTOR mailbox and gateway between the packet BBS network and international AMTOR links.

ASCII (American Standard Code for Information Interchange): The ASCII 7-bit code with an 8th parity bit for error checking, it represents 128 characters, including 32 control characters. The most common code used for asynchronous data transmission by minicomputers and personal computers.

Asynchronous: Occurring without central control or in an unpredictable time interval between successive elements. The typical mode of telegraphy, minicomputers, and personal computers. Requires a transmission of "start" and "stop" bits to provide decoding synchronization at the receiver.

Attenuation: Term denoting a decrease in power between that transmitted and that received due to loss through equipment, lines, or other transmission devices. Usually expressed as a ratio in dB (decibels). (Synonym: loss; antonym: gain.)

Audit Trail: The list of headers (R: lines) attached to every BBS message that is used to trace the path the message assumed from its originating BBS.

Autoforward: Many bulletin board and mail server programs (BBS) are capable of passing messages to each other. The process of a bulletin board recognizing that it has mail to go to another bulletin board, connecting to another board, and then sending the traffic is called Autoforwarding. This allows packet users to send mail in a non-real-time fashion anywhere on the planet where compatible packet BBSes exist.

Autobaud (Automatic Baud Rate Detection): Typically used in modern modems and when initializing many multimode and packet radio TNCs for the first time.

Automatic Route Optimization: In some packet radio systems this feature may denote added ability to adjust routing depending on traffic load or time of day. Some route adjustments may be accomplished by the System Node Operator (SNO) by locking routes to neighbor nodes at a higher quality number than that set in the node's third parameter.

Automatic Routing: A means of internode data and traffic positioning through several network nodes that enables the fastest usable routing. This routing usually is determined by the node. However, the node system operator may influence the routing by installing fixed or locked nodes and/or routes.

Automatic Trunk: A node connection the destination of which is predetermined by the node sysop. Most commonly used feature of the X-1J4 TheNET firmware. This enables or initiates a connect to a programmed destination node.

AX.25: The user level of packet radio (AX.25) is Level 2. The protocol or data "envelope" set aside for use in amateur packet radio. The envelope contains the callsign of the orig-

Say You Saw It In CQ

The Pac-Comm Tiny-2 terminal node controller.

inating station, the callsign of the target packet station, synchronizing, addressing, control, and error-checking characters. It is transmitted as a single "frame" and designated as an AX.25 packet. AX.25 amateur packet radio link level protocol that borrows the link layer from X.25 (also known as "LAPB"), modifies it, and tacks a datagram-style address/routing header on the front.

Backbone: A backbone is a system of links where nodes may communicate without interfering with or being interfered with by local access, and where data may be passed in a fashion and with hardware that is optimized for passing data, rather than optimized for user stations.

Battery Backup: Usually associated with the internal TNC lithium cell used to maintain the information stored in the TNC's RAM. This battery backup holds the "user configuration" while the TNC is OFF. Another form of battery backup is the power source that supplies power to a station or site when utility power is removed or fails. This power source is sometimes called "emergency or auxiliary power."

Baud: A unit of signaling speed. The speed in baud is the number of discrete conditions or signal elements per second. If each signal event represents only one bit condition, then baud is the same as bits per second. Baud does *not* equal bits per second. Another method of expressing baud is "the unit of digital signal speed, equal to the number of events per second."

Baudot: A 5-bit code used in RTTY communications. Named after J. Baudot, an early French inventor of telegraphic instruments. Compare with ASCII, which is an 8-bit code capable of coding 256 characters instead of 32 for baudot.

Baycom: A simple modem and software package designed and supported by DL8MBT, DG3RBU, and the Baycom group in Germany. Early versions were shareware. Recent versions are marketed as a commercial product.

BBS (Bulletin Board System): This is a server which is accessed by packet stations to be a repository for messages and files. These messages and files can be accessed by a packet operator who connects to the BBS. BBS also has a capability called forwarding, which may be used to transfer files between BBSs. *(See Autoforward.)*

Beam: A directional antenna. Beams are usually made of aluminum and are constructed from a horizontal length of tubing having between 4 and 16 one-half wavelength aluminum elements. Beams for packet radio usually cost between $50 and $100. The key features of a beam are directionality and gain. Gain is a figure, expressed in dB, which refers to how much main lobe power is concentrated in the direction to which the beam is pointed. The higher the gain figure, the less power and signal are being wasted in an undesired direction.

BER (Bit Error Rate): The average number of errors that occur per fixed amount of data-bits sent. This number is usually stated as error(s) per million bits. Another way to express BER is the ratio between the number of bits transmitted and the number received in error on a transmission link. This is the process most often used as a measure of quality for data links.

BERT (Bit Error Rate Test/Testing): The process of testing or proving the bit error rate(s). The device used to determine the BER is called a "BERT" meter and may be left in the digital stream without affecting the data being measured. The test method for digital links uses a psuedo-random repeating sequence of bits, comparing the received pattern with the known transmitted pattern for errors. Computing the gross errors over a fixed test interval. Error rate is stated in scientific notation as the number of errored bits per hundred thousand, million, ten million, or hundred million. Minimum acceptable error rate for voice channel data operations is one errored bit per 100,000 transmitted.

BID (Bulleting Identification): Usually applied to BBS bulletins that are forwarded across a packet network. The purpose is to identify or track the bulletin (e.g., source).

Binary: A two-state numbering system represented by the 0 (zero) and 1 (one). A binary digit is called a "bit." Digital data is represented by a one or zero bit when used in packet communications.

Bit: Notation for a binary digit. The smallest unit of digital information. The bit can represent a choice of a one or zero (mark or space) in digital communications. A combination of the words "binary" and "digit."

Bit Duration: The time taken for one bit to pass a point on a transmission link. Also called bit length, bit time, bit interval, bit period, bit interval.

Bit Oriented: Descriptive of data communications protocols using a control byte rather than embedded control characters or control messages as well as having a high degree of transparency to codes used for messages. Typified by IBM's SDLC and the CCITT's HDLC of X.25 packet networks.

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measurement for raw transmission throughput on a link. Often stated in kilobits, megabits, or gigabits. The rate at which binary data is transferred on a circuit. *(See also baud, data rate, transfer rate.)*

Bit-Stuffing: A technique used to prevent confusion between any 111111 bit pattern in the data and the flag character (01111110) used to delimit the start and end of each frame in the packet.

Block: In packet radio communications, a string of data set into an "envelope" of synchronizing, addressing, control, and error-checking characters transmitted as an entity. Equivalent to "frames" (MAXFRAME) in AX.25 packet radio systems.

Boot: Boot, reboot, and system boot refer to a "cold start" of a computer or related devices.

Bridge: In packet networks, a set of nodes (two or more) may be interfaced to form a bridge or gateway (node-stack) between frequencies or baudrates. In LANs, an electronic device providing a logical connection path between two LAN segments.

Buffer: A storage area or device (normally in RAM) where data overflow is contained until RAM or disk space can be made available for storage. The buffer is mainly used to hold data while it is being transferred from one computer to another—e.g., a temporary storage medium to permit some difference in the capacity of two data devices to emit and accept data from each other.

Bug: Computer term for an error or mistake causing a processing delay or stoppage.

Busy Hours: Prime time; that period of hours when connections are most in demand in a packet radio network.

Byte: In computers, a very specifically-sized unit containing 8 bits for the computer to operate on. Sometimes called a "word" in computer systems.

Carriage Return: On a mechanical typewriter the motion of pressing or pushing the carriage return lever to the left until it stops, to allow a new line to be typed on the paper supported by the carriage. On modern computer keyboards the carriage return key still exists and either is labeled <Enter>, Return, or Carriage Return. The function of the carriage return key is to instruct the computer or remote device that the end of a typed line has been reached. In a computer, the binary number 00001101 is generated to cause a carriage return to be sent.

Carrier: A signal of known characteristics that is modulated to carry information. The receiver, knowing the expected characteristics of the carrier, can extract the information from it. However, noise or unintended changes to the carrier will, of course, also be interpreted as part of the information.

CCITT: Comite Consultatif Internationale des Telephones et Telegraphes, or Consultative Committee of the International Telephone and Telegraph. An international counterpart to the Electronic Industries Association in Washington, D.C. EIA standard RS-232 and CCITT V.24 are similar. A major constituent of the International Telecommunications Union (ITU) that sets standards for the operation of telecommunications services across international boundaries. Some CCITT standards are adopted for use in the USA.

Chat Node: See Conference Node; Converse node.

Choke/Unchoke: When a computer is unable to process data as fast as another computer is sending it, the receiving computer may instruct the sending computer to stop sending the data. This condition sometimes occurs in a node network running TheNET node code. An "Unchoke" packet is sent periodically to clear the nodes of a choke condition.

cmd: An on-screen prompt which is displayed by the TNC. This prompt informs the user that the TNC is in the Command mode.

Collision: Simultaneous transmissions on a packet LAN that interfere with each other in a contention-based access scheme. Occurs when two or more terminal node controllers (TNCs) attempt to transmit at nearly the same instant.

Compatibility: A property in data processing and telecommunications systems permitting exchange of information directly and in usable form. "IBM compatible" implies identical or interchangeable signals and methodologies on a non-IBM PC as compared to that of a "true-blue" IBM PC.

Conference Node: A node which has a similar feature to TheNET X-1J+ TALK mode whereby a number of users may connect and enter into a "round-table" discussion. This mode is sometimes referred to as a "Converse node."

Connected: The condition that occurs when two packet stations are described as being "connected." The state in which the two stations read only those packets from each other when MCON is OFF.

Control Character: A character inserted into a data stream to notify the receiver of a special function to perform or to identify the purpose of the data or message associated with it. An example of a control character is the control "G." A control "G" will ring the bell of the connected or target station.

Control Mode: The state a TNC must be in to permit command or control actions to occur—e.g., cmd:.

Control C (Ctrl C): This is used to bring a TNC to the "Command" (cmd:) mode from the "Converse" or "Transparent" mode. It is executed by holding the "Control" key down and pressing the "C" key. In most TNCs it is not necessary to press <Enter> after executing a Ctrl C.

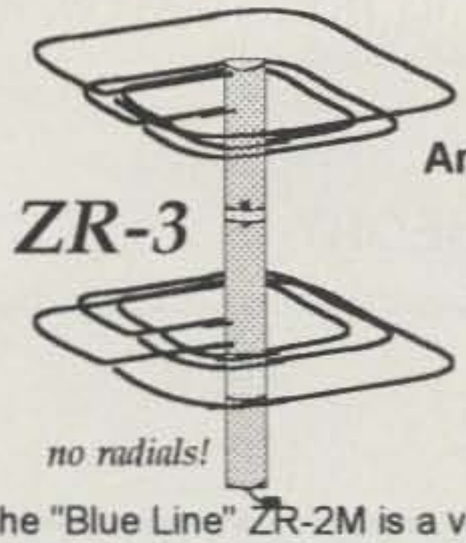
CPU (Central Processing Unit): Controls data flow and "thinking" function within a computer. When supported by a "MATH Coprocessor," it can perform computations at greater speeds.

Cross Connection (X-Connect): In packet radio communications systems, a bit stream addressed between two ports of a node or routing unit.

Summary

Next month we will continue with more of the terms used in "packetese." Until then, don't forget the packet radio www home pages at <http://www.sedan.org>. Have fun packeting!

73, Buck, K4ABT



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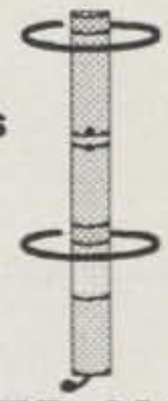

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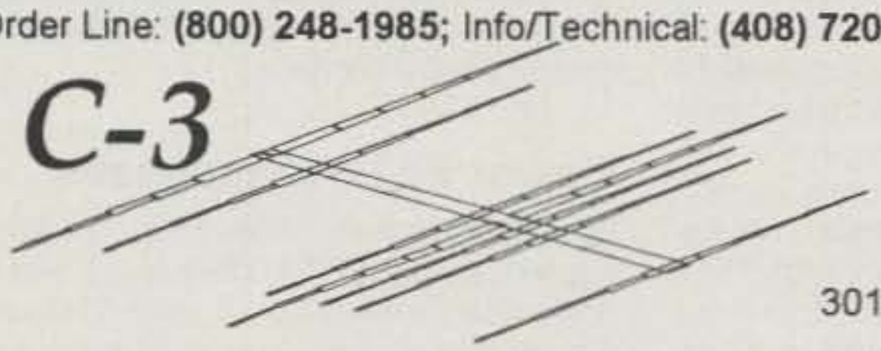

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BY DOUG DeMAW, W1FB

DOUG'S DESK

CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORY

Some Tips on Power FETs
A 60 Watt 6 Meter Linear Amplifier

There are advantages associated with power FETs. In many ways they are easier to work with than bipolar power transistors. Although FETs are more delicate and require careful design steps, they offer the amateur better efficiency and fewer design headaches. The trade-off is higher price, at least for power FETs designed specifically for RF amplification. Although inexpensive switching FETs (such as the IRF470) work quite well up to approximately 10 MHz, they fail to produce much power above that frequency. The internal geometry of switching FETs limits their upper-frequency performance. The built-in protective Zener diodes account for part of the problem.

FET Advantages

Unlike bipolar power transistors (BJTs), FETs offer efficiencies as great as 80 percent, whereas 50 to 60 percent is typical for BJT devices, depending on the class of service. Furthermore, power FETs maintain a relatively constant input and output impedance over a wide range of frequency and power levels. BJTs exhibit large changes of junction capacitance as the operating frequency is varied. This makes it tricky to design an effective feedback network for stabilization and broadbanding. We need not face this problem with FETs.

FETs exhibit uniform gain from, say, 1.8 to 175 MHz. BJTs, on the other hand, have a theoretical gain increase of 6 dB per octave as the frequency is lowered. If a BJT RF amplifier has 10 dB of gain at 7 MHz, the gain can increase to 13 dB at 3.5 MHz, and so on. Therefore, if the amplifier is designed to have a gain of 10 or 12 dB at 29 MHz, it can develop tremendous gain when the operating frequency is dropped to 3.5 or 1.8 MHz. This greatly encourages self-oscillation and potential self-destruction of the transistors. This is not a problem with FETs because of their uniform gain.

The odd-order distortion products and harmonic currents from power FETs are substantially lower in amplitude than those of BJTs. It is a simple matter to extract a clean signal from a power FET linear amplifier. It is worth mentioning here that FETs can be operated without forward bias to provide class C performance. The efficiency of a class C FET amplifier can approach or even exceed 80 percent. I have measured efficiencies as great as 85 percent in narrow-band operation with tuned circuits.

Still another advantage associated with power FETs is their immunity to thermal runaway. When this phenomenon occurs with BJTs, the transistor's gain and collector current increase with heating, thereby elevating the junction temperature even more. This leads to a self-destruct domino effect.

Power FET Weaknesses

Everything is not milk and honey when working with power FETs. They are prone to self-oscillation, especially at VHF. The condition worsens as the gate impedance is raised. The characteristic impedance of the FET gate is one megohm or greater. In practice, we need to

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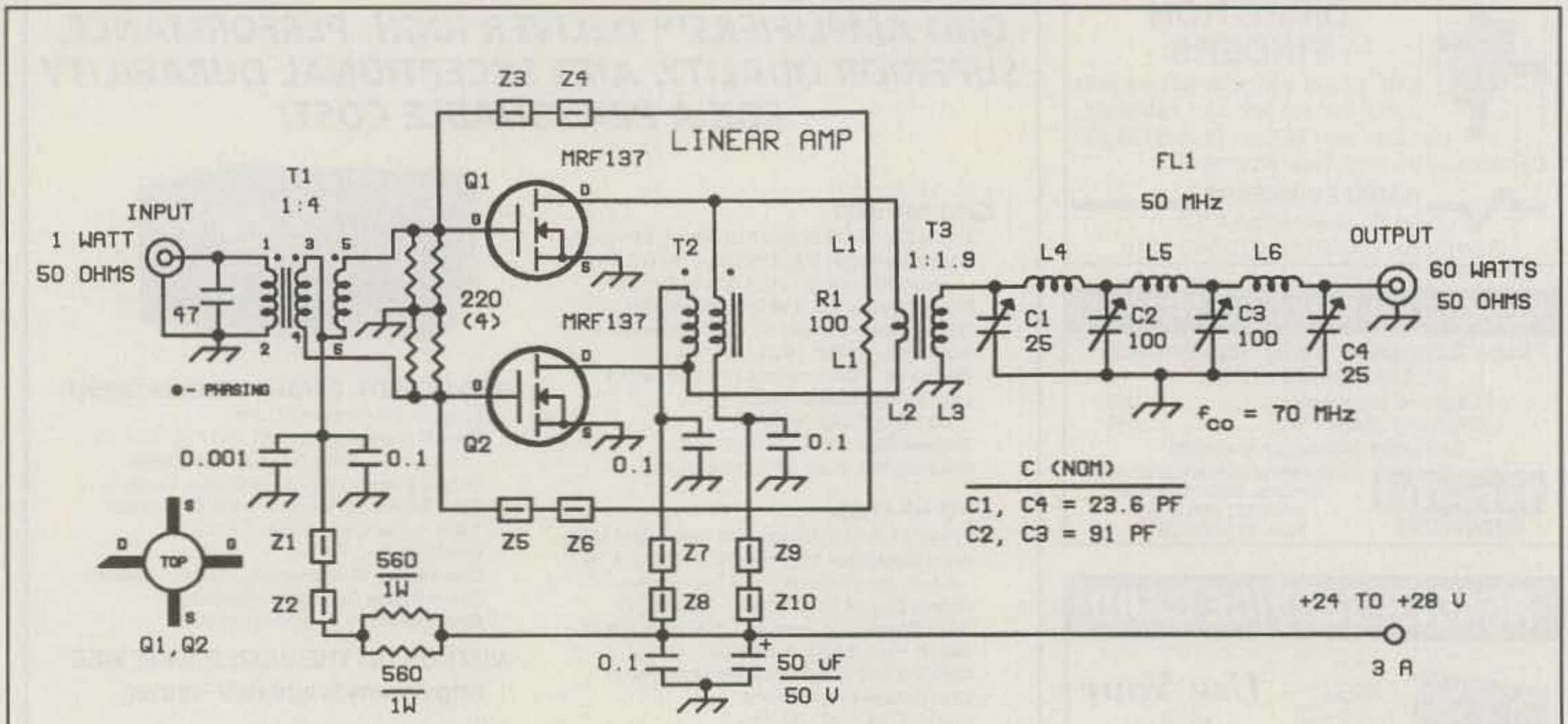

Fig. 1– Schematic diagram of a practical 6 meter, 60 watt power FET linear amplifier. Fixed-value capacitors are disc ceramic. The polarized capacitor is electrolytic or tantalum. Resistors are 1/2 watt carbon or carbon film, unless otherwise noted. Z1 and Z2 are Amidon FB-43-101. The remainder of the beads are FB-43-801. C1, C2, and C3 are ceramic or mica-compression trimmers. L4 and L6 are 0.173 µH air-wound inductors. Use 5 turns of No. 16 enameled wire, 3/8" ID × 1/2" long. L5 is a 0.218 µH air-wound inductor. Use 7 turns of No. 16 enamel wire, 3/8" ID × 1/2" long. T1 has 10 trifilar turns of No. 28 enameled wire through an Amidon BN-43-202 balun core, or 12 trifilar turns of No. 26 enameled wire on an Amidon FT-50-43 toroid. T2 has 12 bifilar turns of No. 22 enameled wire on stacked (two) Amidon FT-50-43 ferrite toroids. T3 has two turns of No. 24 enameled wire for L2 and three turns of No. 24 enameled wire for L3. L1 (see text and fig. 2(A)) is a single turn of No. 26 enameled wire. The T3 core is an Amidon BN-43-7051. All ferrite beads and cores are 850 permeability. Observe phasing (polarity) of T1 and T2.

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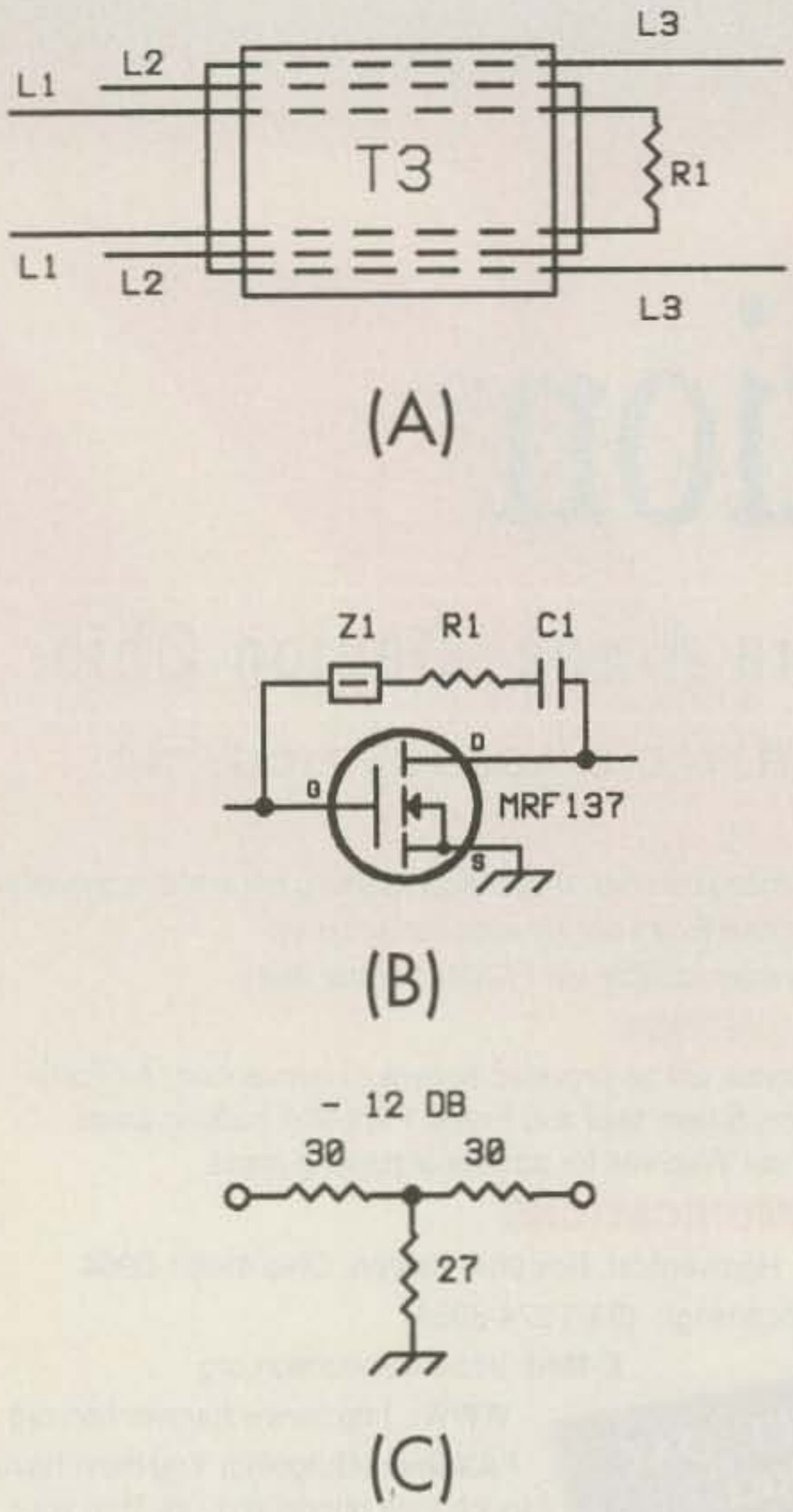
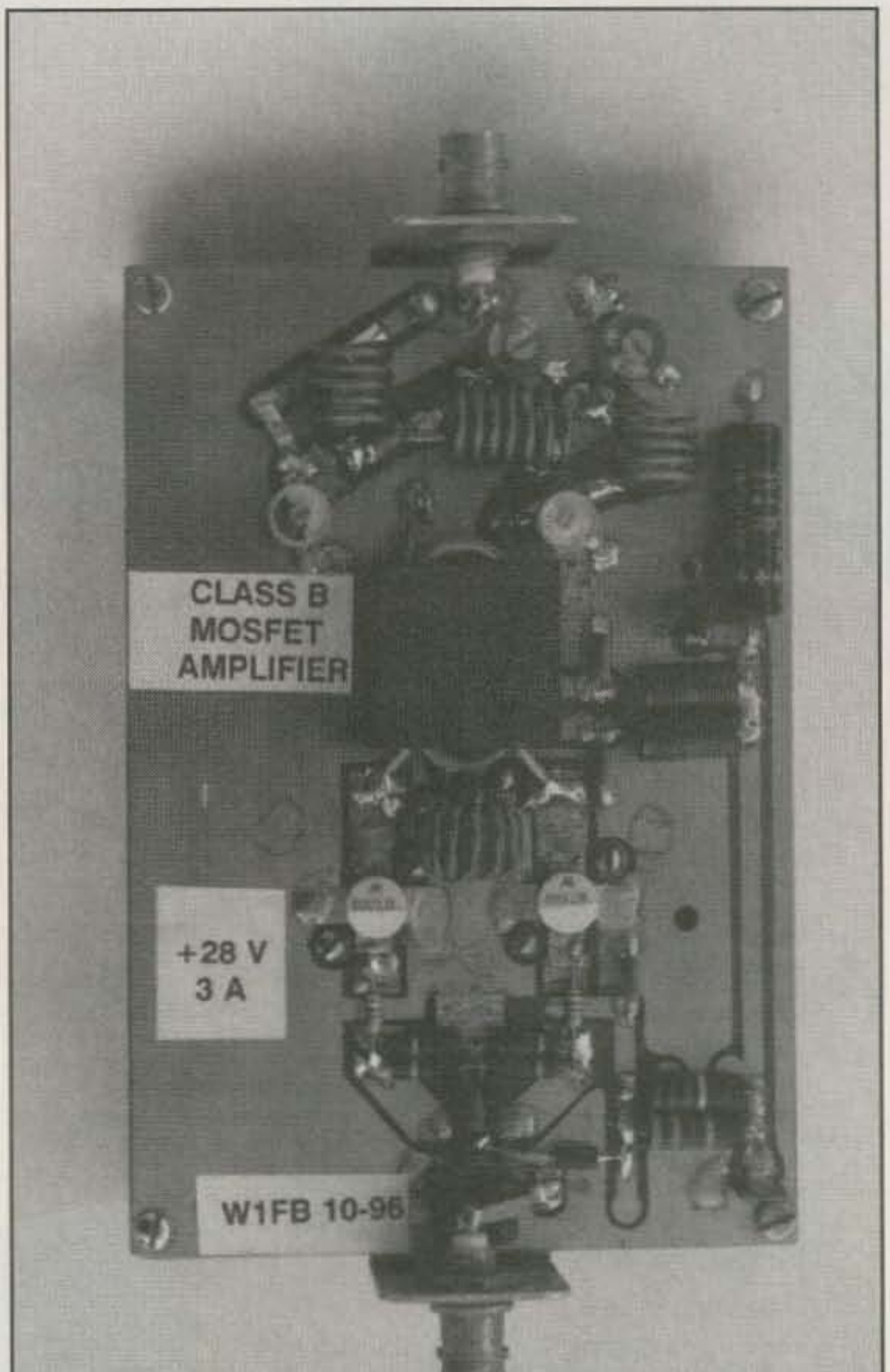


Fig. 2– The details for winding T3 are shown at (A). The circuit at (B) illustrates a different method for obtaining shunt feedback (see text). Circuit (C) is a 12 dB attenuator for use between a 10 watt SSB exciter and the fig. 1 amplifier (see text).



The assembled fig. 1 linear amplifier. The L1 winding for T3 is not shown in this photo. It was added after the photo was taken. The large finned heat sink is below the PC board, but is not visible because of the angle used when photographing the assembly.

lower that to a few hundred ohms or less if stability is expected. The gate resistor in the bias network establishes the operating impedance. For example, in fig. 1 the four 220 ohm resistors in the gate circuit set the impedance at 220 ohms, gate to gate. Since FETs require voltage rather than current (unlike BJTs) to make them conduct, the lower the gate resistor value the greater the RF driving power needed to make them conduct. Most power FETs require up to 25 volts pk-pk to make them percolate. A 5o ohm resistor could be used in a gate circuit, but the excitation power would need to be increased accordingly for an equivalent output power.

Power FETs can be destroyed instantly if gate-source or drain-source voltages exceed the maximum rated values. Spikes along the V_{DD} or bias lines can cause device failure. Similarly, if there are spikes in the RF excitation voltage, gate damage can occur. Vigorous self-oscillation may generate peak RF voltages that can cause a breakdown in the drain-source junction. This has been known to happen when high output SWR (short or open circuit) occurred, thereby removing the normal load from the output filter. Self-oscillation may occur during this condition. It is always wise to do initial testing of a new FET amplifier with greatly reduced operating voltage. If an amplifier is designed to operate at +28 volts, initial testing can be done at +6 or +8 volts. Normally, if self-oscillation is likely to occur, it will show up even at reduced V_{DD} levels.

A Practical Circuit Using FETs

Fig. 1 shows a circuit I developed through necessity. Six meter amplifiers for the lower power levels generally are not found on the amateur market. I needed an amplifier that would work with my MFJ 10 watt 6 meter SSB transceiver. The circuit in fig. 1 evolved.

Two Motorola MRF137 FETs are used in push pull to provide 60 watts of output power. The gate bias circuit sets the idling current at 70 ma for class AB operation. Regulation of the bias is unnecessary because the transistor gates draw only microamperes of DC current. Gate bias is usually taken from the V_{DD} supply line by way of a simple resistive divider, as seen in fig. 1. Ferrite beads Z1 and Z2, along with the bypass capacitors above them, decouple the drain circuit from the gate-bias line to aid stability. A 1:4 step-up transformer, T1, matches the 50 ohm input to the 220 ohm gate circuit.

T2 serves as a bifilar-wound RF choke that reverses the phase 180 degrees for push-pull operation. The symmetry of T2 helps to ensure circuit balance. It would be necessary to center tap L2 and feed the +28 volts through it to Q1 and Q2 if T2 were not used. Z7 through Z10, plus the associated bypass capacitors, effectively decouple the drain supply line from the remainder of the circuit. The 50 µF capacitor provides effective bypassing for low frequencies down to the audio range.

Winding L1 at T3 is a single-turn, U-shaped wire that is passed through the T3 balun core. R1 is located on the FL1 side of T3 (see fig. 2(A)). L1 is a feedback winding to stabilize Q1 and Q2. I added L1 after observing some mild self-oscillations when the amplifier was in

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standby with operating voltage applied. Z3 through Z6 act as small inductors to regulate the flow of feedback current. The greater the feedback the lower the amplifier gain. R1 can be adjusted in value to provide the desired amount of feedback. Use only enough shunt feedback to ensure amplifier stability.

Harmonic Filtering

FL1 of fig. 1 is a 7-element low-pass Butterworth filter. It provides attenuation of 40 dB or greater for all harmonics of 50 MHz. Although fixed-value silver-mica capacitors would be suitable for C1 through C4, the capacitances formed between the PC conductors and the ground-plane side of the board introduce unwanted additional capacitance which complicates selecting the precise values needed (see the nominal C values listed in fig. 1). I use trimmers to permit obtaining the specified C. Although ceramic trimmers are shown the photograph, it is okay to use mica compression trimmers. The trimmers are set for maximum output power at 51 MHz.

L4 through L6 are air-wound, self-supporting coils. The coils could be wound on toroid cores if suitable low-permeability material were used. I found the Qs of the air-wound coils to be much higher than those I wound on toroid cores. FL1 is designed for a bilateral impedance of 50 ohms. T3 matches the transistor drains to the 50 ohm filter.

Construction Notes

Missing in the photograph of the assembled 6 meter power FET amplifier are L1, R1, and Z3 through Z6. That feedback network was added after the photograph was taken because of the instability problem discussed earlier.

The FL1 inductors, L4, L5, and L6 are mounted at 90 degrees to one another to minimize mutual coupling. The latter condition would spoil the filter performance. Shield partitions can be installed between the coils to aid isolation.

The circuit board is larger than necessary. It measures 4" × 6". That size was chosen to match a finned aluminum heat sink I had available. The massive heat sink is overkill for a 60 watt amplifier. It would be entirely suitable for a 150 watt amplifier.

All of the components are soldered to the etched side of the double-sided PC board. The bottom of the board serves as a ground plane to enhance stability and help prevent unwanted RF ground loops.

T1 and T3 are wound on Amidon balun or "binocular" cores.[1] Toroid cores of suitable cross-sectional area can be substituted for the balun cores if layout symmetry is maintained. Avoid long transformer leads no matter what type of core you use. It is important to use wide PC conductors, especially at VHF. This minimizes the inductance of the strips, which becomes a part of the RF circuitry on a PC board. Excessive parasitic inductance can spoil the Q of a resonant circuit and can become an unwanted inductive extension of a coil or transformer.

Q1 and Q2 are attached directly to the heat sink below the PC board. Cutouts in the PC board enable the FETs to be mounted on the heat sink. Heat-sink compound is used at the transistor/heat-sink junctions to provide an effective path for the heat.

Z1 and Z2 are miniature Amidon ferrite beads. The remainder of the beads are jumbo-size Amidon units. The permeability of all of the beads is 850.

Alternative Feedback Network

Fig. 2(B) shows a more conventional style of feedback network. It is used extensively in BJT RF power amplifiers where the feedback needs to increase as the operating frequency is lowered. This is because of the 6 dB per octave gain increase mentioned earlier. I tried the network at fig. 2(B) in the amplifier of fig. 1. It performed fine with 560 ohms at R1 and 0.001 µF for C1. Z1 was a jumbo ferrite bead. The value of R1 can be varied to increase or decrease the amount of shunt feedback.

Some Final Comments

A resistive T-pad attenuator is desirable at the input of the fig. 1 amplifier if the exciter has more than one or two watts of output power. I built the attenuator in fig. 2(C) for use between my 10 watt transceiver and the amplifier. Two watt carbon resistors are required for the fig. 2(C) circuit. Other resistor values for different levels of attenuation can be obtained from the tables in the *ARRL Electronics Data Book* or *ARRL Handbook*. The VE3ERP Hamcalc software has a program for designing pi and T attenuators.[2]

The fig. 1 amplifier can be used on any amateur band from 160 through 10 meters by modifying the constants for FL1 (see earlier W1FB article[3]). No other changes are necessary. A filter design program is included in the VE3ERP software.

The FETs used in my amplifier are MRF-138s. I have been advised that they are no longer made by Motorola and that MRF137s offer the same performance at a lower price.

A simple RF-actuated switch-around TR circuit for use with transceivers that drive outboard amplifiers is shown on page 163 of *W1FB's Design Notebook*.[4] It can be built on the fig. 1 PC board, or separately on its own board.

Footnotes

1. Amidon Associates, Inc., 250 Briggs Ave., Costa Mesa, CA 92626 (714-850-4660). Catalog available.

2. Hamcalc on a 3½ inch disk is available from George Murphy, VE3ERP, for $5. Address is 77 McKenzie St., Orillia, Ontario L3V 6A6, Canada.

3. Doug DeMaw, "Go Class B or C with Power MOSFETs," *QST*, March 1983.

4. *W1FB's Design Notebook* and *W1FB's QRP Notebook* (2nd edition) are available from The ARRL, Inc., 225 Main St., Newington, CT 06111, or from authorized ARRL book dealers.

73, Doug, W1FB

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Antenna Tuners and Related Matters—Part II

The first part of this two-part article covered baluns, decibels, dummy loads, feedlines, grounds, height and clearance of antennas, image rejection and manufacturers. We now move on to the conclusion.

Q

The Q of a resonant inductance-capacitance circuit is a measure of its quality. Capacitors offer practically no resistance to the RF current that flows in a resonant circuit, but inductors offer more resistance than capacitors. Consequently, Q is usually considered to be equal to reactance (X) divided by resistance (R). If a one-half cycle of RF energy is applied to a high-Q circuit (resonant to the frequency of the input energy), it will circulate back and forth in the circuit many times before the circuit's low resistance eventually causes it to decrease in amplitude to nothing. The final RF amplifier stage in a modern transmitter (or linear amplifier) has silver (or other) plating on the tank circuit's inductor to minimize resistance and to increase the tank circuit's Q.

Random-Wire and Long-wire Antennas

These antennas can provide surprisingly good operating results. They are particularly useful in portable and emergency operating situations. If the length of the wire antenna is less than a full wavelength at the lowest frequency concerned, it is a random-wire antenna. Obviously, an antenna that is classified as a random-wire antenna on a low-frequency band could qualify as a long-wire antenna on higher frequency bands, since it could be a wavelength (or more) on higher frequencies. Random-wire and long-wire antennas can be fed at a current loop or at one end, but they are usually end fed. The minimum length of a random wire is considered to be one-quarter wavelength, but shorter antennas can provide reasonably satisfactory performance. These wire antennas are equally useful for transmitting and receiving functions. Both of these wire antennas can be operated on several bands, which is a useful feature. Another wire antenna advantage is it does not require a separate feedline; thus there is no transmission-line loss and no possible different transmission-line impedance. I have enjoyed thousands of domestic and foreign contacts while using these types of wire antennas.

A long-wire antenna generally provides better performance than a random-wire antenna. Furthermore, the longer the wire the better it functions. However, even a minimum length long-wire antenna exhibits more gain than a standard half-wave dipole in the most favorable direction(s), but less gain in all other directions. Radiation resistance increases as antenna length is increased, which is desirable. If the long-wire is relatively short (in relation to the frequency), four loops of radio frequency energy radiate out from the antenna forming an X-shaped radiation pattern, assuming that the long-wire is end fed and is not terminated at the far end. If the longwire is lengthened, or the same length antenna is used at a higher frequency, those radiation loops become more in line with the wire antenna, resulting in improved fore and aft directivity off the ends of the antenna. Long-wire antennas should be at least 2 1/2 wavelengths to produce good directivity.

If it is desired to increase power in two loops by eliminating the radiation loops from the opposite direction, the opposite end of the long-wire antenna can be terminated through a resistor. A pseudo ground can be established by adding a 1/4 wavelength piece of wire past the terminating resistor. Additional directivity can be achieved by sloping the end of the long-wire antenna down in the desired direction.

Fig. 2 shows the procedure that should be used to determine the optimum lengths of these wire antennas.

V-beams and rhombics are more sophisticated and more effective versions of long-wire antennas. A rhombic can provide about 15 dB gain over a dipole, and it can be used over a frequency range of about four to one (4:1).

Wire antennas can exhibit good directivity characteristics, but high-frequency ones cannot be rotated. However, they are suitable for use in some situations. Random-wire and long-wire antennas are good choices when emergency antennas must be erected in a hurry.

There are several inexpensive single-wire antenna tuners available. Basically, they can be used to change the electrical (not physical) lengths of wire antennas. Series inductance electrically lengthens a wire, whereas series capacitance electrically shortens it. Most of the more expensive antenna tuners can also be used to electrically tune wire antennas. When using a tuner with a wire antenna, the tuner must be connected to a good radio frequency ground.

$$\ell = \frac{492\ (N - 0.05)}{f\ (MHz)}$$

where:
ℓ = length of antenna, in feet
N = number of half waves desired on antenna
f = frequency, in megahertz

Example:
Using a 40 λ antenna on 15 λ

$$\ell = \frac{492\ (N - 0.05)}{f\ (MHz)}$$

$$\ell = \frac{492\ (3 - 0.05)}{21}$$

$$\ell = \frac{492\ (2.95)}{21}$$

$$\ell = \frac{492 \times 2.95}{21}$$

$$\ell = \frac{1459.40}{21}$$

$$\ell = 69.5 \text{ feet}$$

Fig. 2– How to determine lengths of long-wire antennas.

Spurious Emissions

A spurious emission from a transmitter is any emission at other than the desired output frequency. Inadequate selectivity in the output stage of a transmitter can allow spurious signals to be emitted. Another form of spurious emissions can be *harmonics,* which are integrals (whole number multiples) of the desired output frequency. The FCC specifies maximum allowable levels of spurious emissions for various equipment. A spectrum analyzer can be used to check spurious signals.

Spurious emissions and image signal rejection are reduced by the high-Q resonant circuits of an antenna tuner. A tuner also improves the resultant front-end selectivity of the receiver.

The high-pass characteristic output of an antenna tuner should be a rejection factor of 20 to 25 dB to minimize the possibility of spurious emissions. However, this rejection factor is only 3 to 6 dB for some tuners. The ultimate transmatch circuit design exhibits this low rejection factor. The series-parallel capacitance (SPC) type of transmatch does not exhibit this problem. With output loads of 25 to 1000+ ohms, and the usual 50 ohm transmitter output, the bandpass characteristic of the SPC transmatch is maintained because a substantial amount of capacitance remains in parallel with the inductor, which is not the situation with the ultimate transmatch circuit. Tuning of an SPC transmatch is sharper (more critical) than the tuning of an ultimate transmatch, due to the higher Q of its resonant circuitry. Therefore, vernier (fine adjustment) control knobs are used as SPC transmatch tuning controls. This critical tuning

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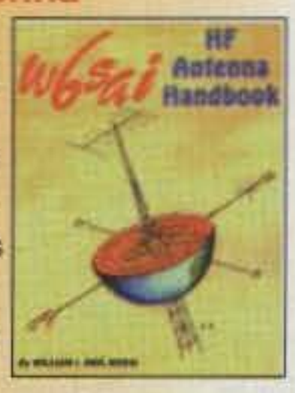

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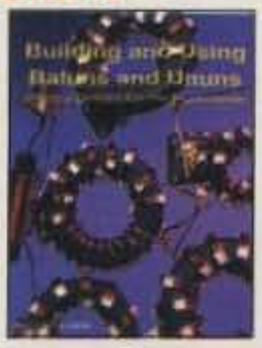

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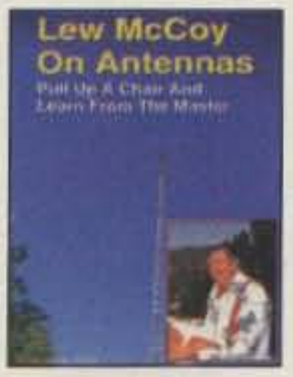

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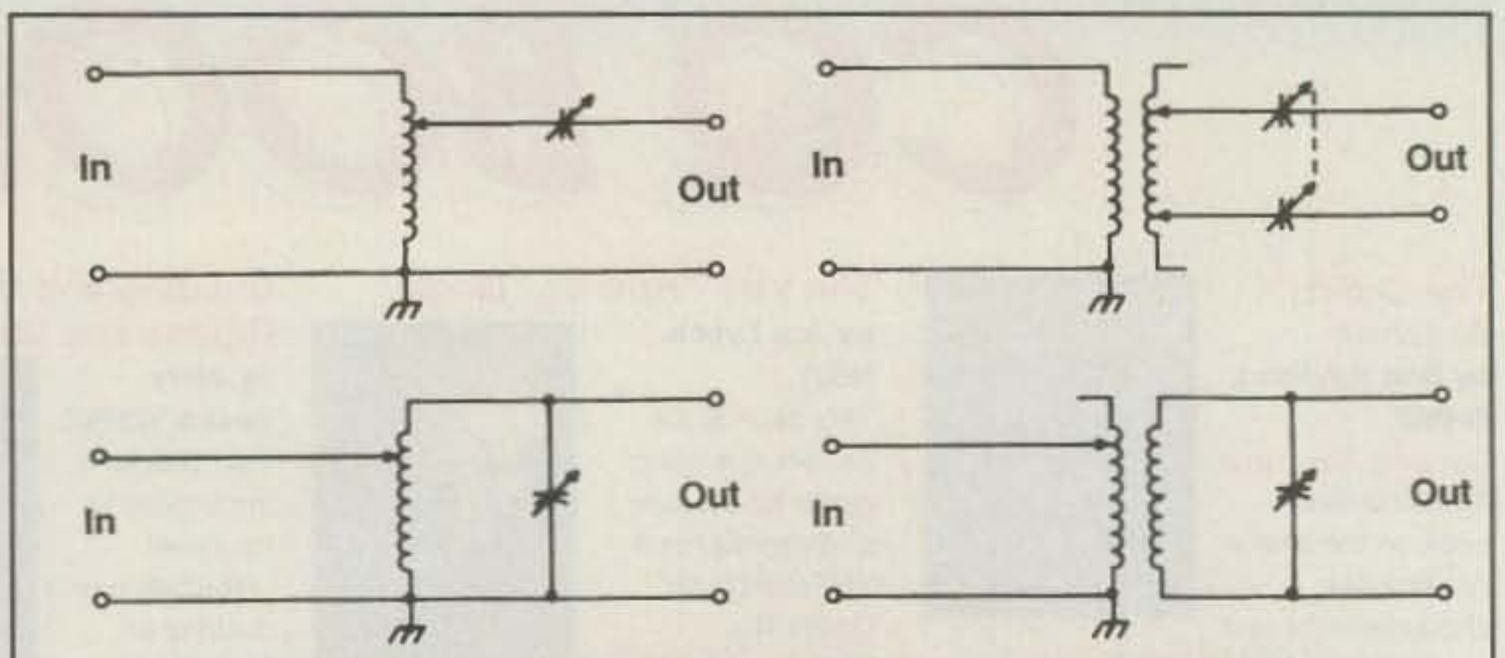

Fig. 3– Simple antenna tuner circuits.

of the SPC transmatch is particularly noticeable on the 160, 80, and 40 meter bands.

Harmonics are integral (whole number) multiples of a fundamental frequency. As examples, harmonics of 7007 kHz include 14,014, 21,021, and 28,028 kHz, etc. The primary problem related to the radiation of harmonics is that they are on other than the desired frequency, possibly causing unintentional interference to other radio communications. Another reason to minimize harmonic radiation is that energy expended radiating harmonics is not available to the emission of the desired signal on the intended frequency. Harmonic radiation can be minimized by using high-Q output tank circuits, low-pass filters at transmitter outputs, and band rejection filters that are resonant at a specific particularly bothersome frequency, such as a television channel. It is imperative that linear amplifier bias and input drive be adjusted carefully to minimize the possibility of harmonic radiation. Class C radio frequency amplifiers are particularly likely to produce harmonics.

Fig. 3 shows typical simple tuner circuits. Most of the modern antenna tuners are much more complicated than the circuitry shown in this figure.

Tuner Adjustment Procedure

If an impedance bridge is available, it should be used to adjust the antenna tuner. This method eliminates any need to emit signals on the air. If an impedance bridge is not available, the antenna tuner should be adjusted as follows:

1. Adjust the transmitter and receiver to the same frequency, if they are separately controlled.

2. Adjust the tuner to where the signal/noise output of the receiver is maximized.

3. Preset the transmitter controls to the approximate correct positions relative to the selected frequency.

4. Turn on the transmitter and apply a low-power signal to the tuner.

5. Adjust the tuner controls to achieve a minimum SWR reading. If a separate SWR meter is used, it should be connected between the transmitter's output and the antenna tuner's input.

6. Adjust the transmitter to produce full output power.

7. Fine-tune the antenna tuner to obtain a minimum SWR reading. The impedance match and SWR are the same at both low and high power. However, slight corrections to the null point adjustment are easier to detect at high-power levels than at low-power levels.

8. Identify the station every ten minutes during prolonged testing, plus at the conclusion of the adjustments.

9. Record antenna-tuner control settings to permit these controls to be preset prior to future use.

10. Repeat steps (1) through (9) to determine the control settings on all the other bands you use.

Antenna Tuners

There are many different antenna tuners available to amateurs. Some are built into the transceivers, whereas others are external, separate units. Most of the modern antenna tuners have a built-in SWR and/or RF output power meter. Prices and sizes vary from small to large. Basically, you get what you pay for; top-quality tuners are expensive.

Antenna tuners are commonly used to "tune" the overall antenna system, which includes the antenna and the feedline. If your antenna system involves several different antennas and feedlines, antenna-tuner adjustments are customized to suit each one. These tuners are generally classified as transmatch units. They do not correct the standing-wave ratio (SWR) caused by mismatches between the transmitter's output impedance and the impedance of each antenna system; the tuner just hides such impedance mismatches from the transmitter. It is important to mask high SWR conditions from a solid-state transmitter because the output power is automatically reduced as the SWR increases. This feature protects the transmitter from possible damage, but it makes it necessary to make the transmitter seem to be feeding a 50–75 ohm load to obtain maximum output power. Antenna tuners enable us to achieve the desired apparent matching condition.

An antenna tuner is an impedance matching device. The nominal output impedance of the transmitter section of a modern transceiver is 50 ohms, which is also the nominal input impedance of the receiver section of a modern transceiver. Antennas vary from low values (such as 25 ohms) to high values (such as 1000 ohms). The antenna tuner is used to present an output load impedance that seems to match

Here is 72-year-old E. B. MacKenzie, VK5PEB, who lives in Lower Mitcham, South Australia. His station includes a Yaesu FT-757-GX high- frequency rig and a Kenwood TR-751-A 2 meter transceiver, plus a homebrew 2-element 10 meter Delta loop and a 10 through 80 meters inverted Vee antenna.

the 50-ohm transmitter output requirement. Maximum power transfer occurs from the transmitter to the antenna system when impedances are matched. The load presented to the transmitter output must seem to be purely resistive, with neither a capacitive reactance nor an inductive reactance characteristic. Real antenna systems have reactive characteristics which antenna tuners hide from transceivers. One (ore more) inductors and capacitors in the tuner cancel out antenna system reactance and convert the resultant resistance to the desired (50–75 ohm) value.

The transmitter output of modern transceivers is almost always unbalanced, which means that the center connection is above ground whereas the other side of the radio frequency output is attached to chassis ground. The antenna tuner accepts this unbalanced transmitter output and uses an internal balun to convert it into the balanced input that is applied to some antennas. Similarly, the balanced signal received from the antenna is converted into the unbalanced input signal that the receiver requires. In addition to accomplishing the desired changes between balanced and unbalanced conditions, the antenna tuner matches impedances between the transceiver and the antenna system. A balun at the output of an antenna tuner makes it possible to use a 300 to 600 ohm feedline, which is the preferred impedance to use with multiband tuned dipoles, V-beams, and rhombic antennas. Coaxial cable can also be used to fabricate baluns, which is a practice common to antennas themselves.

The antenna tuner can help reduce the possibility of the transmitter's output causing radio frequency interference (RFI) such as television interference (TVI). The resonant circuits in the tuner tend to reject other (spurious) frequencies. If the tuner has a suitable bandpass characteristic, it tends to pass the desired transmitter output energy while opposing undesired spurious output energy, including parasitics and harmonics. This rejection characteristic is related to the Q (resonance characteristic) of the circuit after impedances have been matched; the higher the Q, the more the spurious signals are rejected.

Some antenna tuners use link coupling between the transmitter and tuner, as well as between the tuner and the antenna. This type of tuner has no direct mechanical connection to either the transmitter or the antenna. The use of link coupling minimizes the possibility of standard broadcast (amplitude modulation) stations causing interference to 160 and/or 80 meter reception. Powerful AM broadcast stations sometimes create such interference due to high power causing front end overload and/or rectification at the input of a receiver. This type of tuner can be used with both balanced and unbalanced antennas, but it is more commonly used with balanced antenna systems.

Summary

It is hoped that this article has helped you achieve a better understanding of the importance of antenna tuners. There are many currently available books which cover antennas and antenna accessories. The American Radio Relay League (ARRL) publishes three extremely useful books regarding these subjects; they are the *ARRL Antenna Compendium, The ARRL Antenna Handbook*, and *The ARRL Handbook*. A glance through amateur radio magazines should disclose many other publications that could help you better understand antennas and antenna accessories.

Printed Aids

My previous columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs. A list of these printed aids will be sent to anyone who requests it and sends a business-size (#10) self-addressed, stamped envelope to my California address. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their requirements.

73, Bill, W6DDB

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WORLD OF IDEAS

A LOOK AT THE WORLD AROUND US

QRP: Red Hot and Cookin'—Part II

Say last month's show-and-tell column piqued your interest in homebrewing and you're ready for another quick-assemble QRP project? Well, gang, we have it—along with more ideas and encouragement to get you going in high style with low power! Our first tidbit of good news is the Micronaut. That hot-sauce-powered QRPp transmitter featured in last year's QRP column is back. Many of you were left holding returned checks when Sescom bowed out of the game (possibly overwhelmed by all the orders). I thus picked up the pace (no sauce pun intended!) and now have a big batch of even better (Mark II) Micronaut kits ready to mail from my house to yours.

Second in the good news department is that Index Lab's recently announced multifunction accessory box, which mates with their popular QRP PLUS CW/SSB transceiver, is previewed in this month's column. An informative mix of enthusiasm-boosting notes on QRP will be included as we continue, so let's get started!

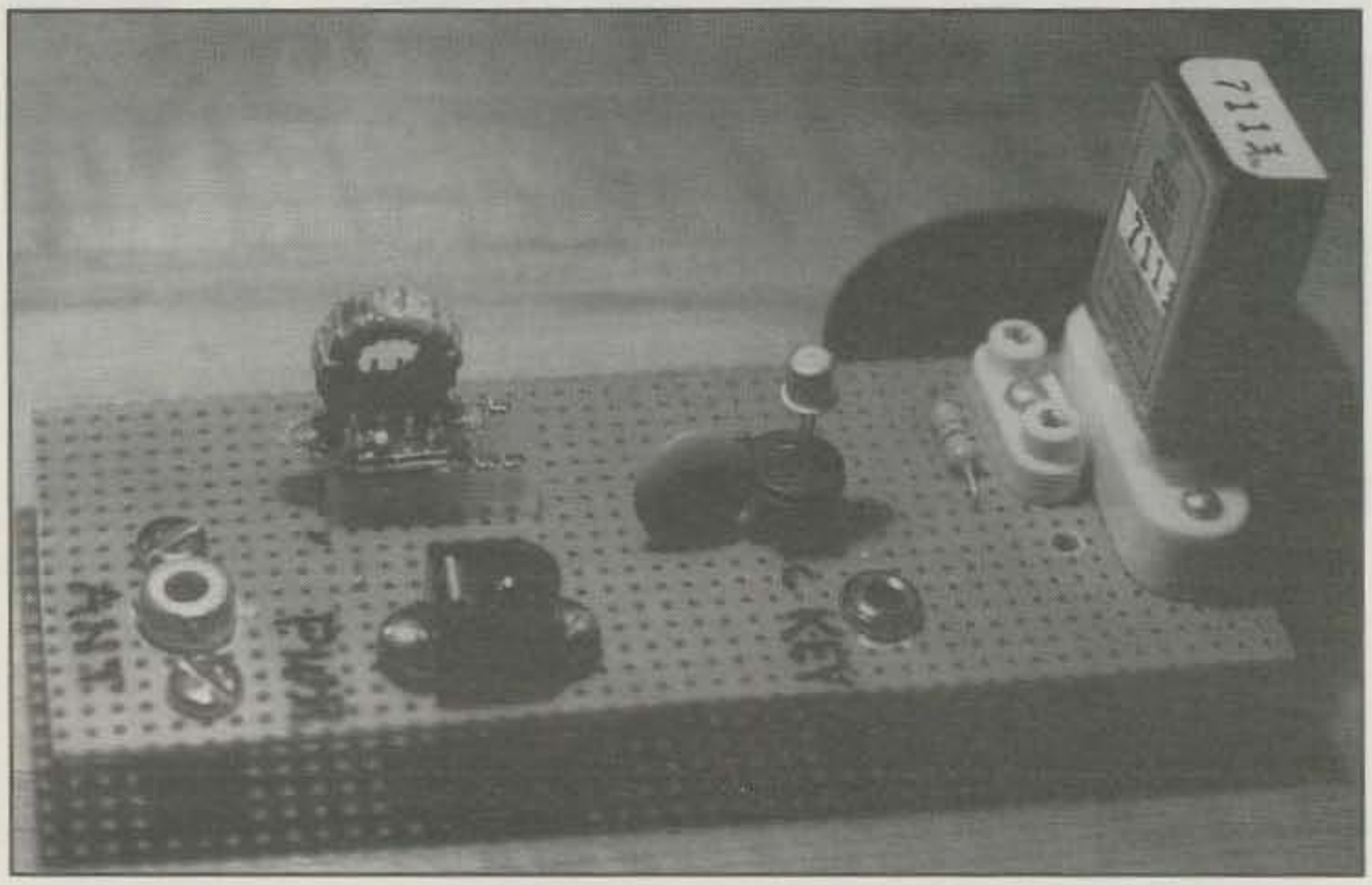

Photo 1– W9LYN homebrewed this Micronaut right from scratch, and its on-the-air debut turned a 500 mile QSO. Next Bill is considering powering the little gem from homemade batteries using Tabasco sauce for true milliwatting fun as I discussed last April.

Secrets To Success Working QRP

Since I passed along some time-proven techniques for no-miss homebrewing last time, let's begin this month with some tips for increasing your success when operating QRP: stated in the simplest of terms, top results with QRP calls for superb operating techniques and a positive mental attitude—in that order.

Sharp operating skills begin with the ability to send good CW—an art anyone can master with regular practice. Imagine how your off-the-air Morse sounds to others and strive for accuracy in dots, dashes, and spaces. Tape record your sending, and then compare it with W1AW or a good code practice tape. More and more often I hear stations sending dots and dashes of almost the same length and letters (?) run together so no one can decipher them. A sharp QRPer can run circles around those operators.

Next, use short and precisely timed calls. If a DX station is already sending a reply when your rig switches back to receive, your code is too slow or your transmission is too long. Try sending your call letters only once and slightly faster in speed than the DX station. Still no luck? Push back your key, listen a while, and note operating techniques of stations making contacts. Within a few minutes you will be able to recognize which ones will wrangle a QSO, which ones will miss, and why (a quite entertaining study, I might add!). When you reach the point where you can predict who will make the next QSO with good accuracy, you are ready to enjoy "high success" QRP DXing.

Split-frequency DXing is probably the easiest route to success for QRPers, as less-proficient operators often stumble over each other and leave your weak signal standing alone and quite readable on a clear frequency. Yes, and the larger the pile-up, the greater your odds of success (the bigger they come, the harder they fall!). Once again the secret is listening. Use dual VFOs to spot each station making a contact and to copy both sides of the QSO. After a few contacts, you will realize how the DX station is tuning and where he/she is copying callers. Note those spots. Start mentally predicting who will be the next contact, let it happen, and then put your call letters into the open slot and snag a QSO on the first call. Think positively. Do not be concerned about running low power. Operate with all the confidence of using 100 watts, and everything will come together in your favor. It works!

Most of our previous notes are equally applicable to SSB DXing with QRP. The main difference is more amateurs operate sideband. Thus there are more alligators in the pond (all mouth and no ears). Perfecting your speech is a true asset. Quite frequently, I hear callers spouting "slur, free, mumble, mumble, zulu—over," etc. (say what?!). Even if the DX station hears them clearly, he is perplexed as to what he heard!

Finally, strive to avoid being entrapped in packet-cluster-listed DX pile-ups and "do your own thing" instead. You soon will find the "big scream contests" make nice decoys while you softly work even better DX up or down the band.

That's enough hype for now. Good luck, and may the force of QRP be with you!

The Micronauts Return!

Remember that easy-to-assemble and hot-sauce-powered Micronaut featured in last year's April and May columns? Some folks homebrewed them on perfboards, others built them from Sescom's kits, and everyone reported having a ball Micronauting. One of the neatest built-from-scratch Micronauts I have seen so far is shown in photo 1. This version was put together by Bill James, W9LYN, and he really did it up right. Bill made the output filter a plug-in unit for quick-change multiband operation, plus included parallel wired sockets for older FT-243 or newer HC-6 crystals. He also allocated room to add a coil and capacitor for crystal warping in the future plus a socket for the transistor. Clever idea, Bill, as some 2N2222/PN2222s do indeed oscillate better than others at very low voltage. When tried on the air from his home in Illinois (and with the juice cranked up from 2.5 volts to 12 volts), Bill's first contact was with KE4PDU in King's Mountain, North Carolina. Distance between the two stations was approximately 500 miles. With 12 volts at 10 ma, that calculates out to approximately 0.2 milliwatt per mile. Now that is what we call Micronauting in high style!

As I mentioned earlier, Sescom produced only a limited number of Micronaut kits. Many of you expressed dismay over their brief production of the kits, as it seemed like a premature end to what could become a series of sport QRPp projects.

Anything this popular has to continue! I have now made some improvements for greater versatility to the Micronaut, worked up a good arrangement with FAR Circuits on producing PC boards, and presently have a nice batch of

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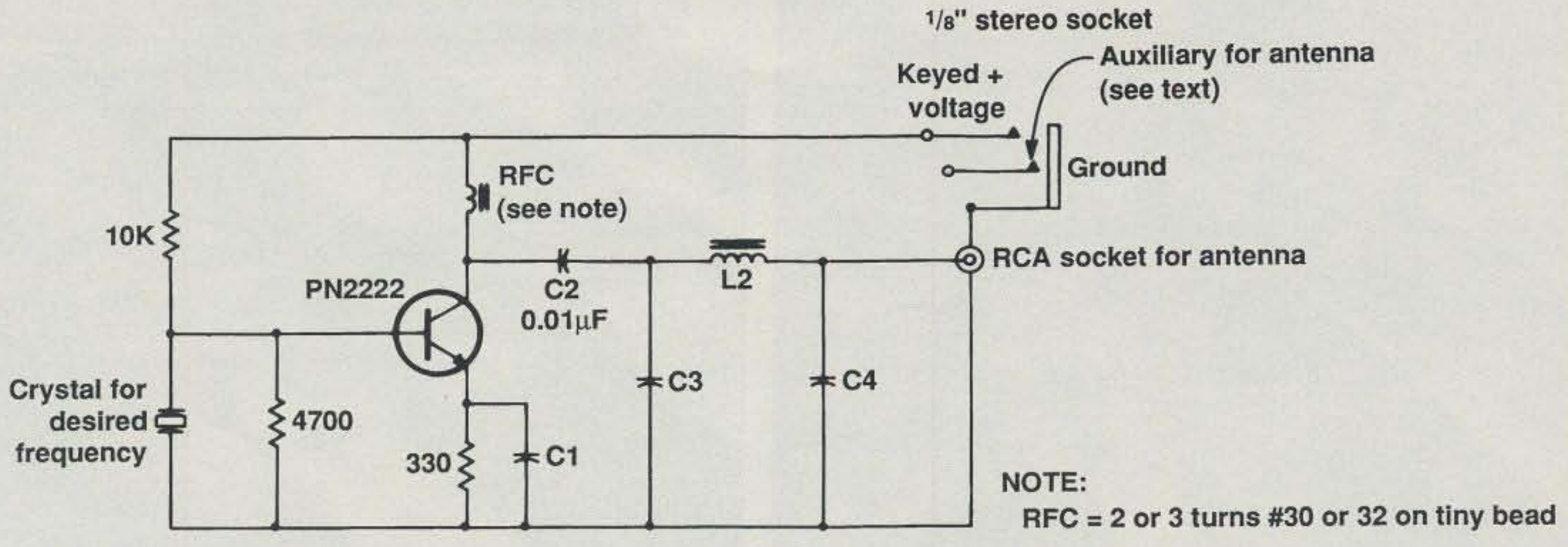

Coil and Capacitor Data for The Micronaut

Band (m)	C1 (pFd)	C3 (pFd)	C4 (pFd)	L2	Inductance (uHy)
20	270	270	270	12 turns #28 or #30 on T-50-2 core	.720
30	330	330	330	13 turns #28 or #30 on T-50-2 core	.980
40	470	470	470	16 turns #28 or #30 on T-50-2 core	1.280
80	750	750	750	34 turns #30 or #32 on T-50-2 core	5.780

Fig. 1– An updated circuit diagram of the Micronaut. If desired, antenna output can be shifted to the center pin of a 1/8 inch stereo socket for one-plug operation.

Photo 2– New Micronaut kits in various stages of assembly. The units are unique, as they will operate from ultra-low voltage sources such as watch batteries, homemade hot-sauce batteries, or slot-car motors reversed to work like a miniature generator. A prewound coil has been included in the kit since this photo was taken.

Micronaut kits ready for shipping. If this supply runs dry, everything is organized to produce more as needed.

Some of the new Micronaut kits are shown in photo 2, and the Micronaut's rearranged circuit diagram for those of you desiring to build one from scratch is included in fig. 1. The new Micronaut board has both sockets mounted on the same end to make final hook-up more convenient and to permit easy installation in a variety of enclosures. It is also sized to fit perfectly in a Sescom 1" × 1" × 2" MPB-1 box, which is now optional rather than included. (In other words, you can be creative in finding a unique case for your Micronaut, or telephone Sescom at 1-800-634-3451 to order an MPB-1). The new board is also laid out so you can omit the RCA antenna socket, substitute a three-conductor (stereo) 1/8 socket for the two-conductor socket, add a short jumper, and connect both keyed voltage and antenna using a single stereo 1/8 inch plug. Alternately, you can include a small battery in your Micronaut's enclosure, wire it to the stereo socket's middle connection, fit a pushbutton key into a stereo plug's back/barrel end, and have a fully self-contained QRPp transmitter. A dozen more variations in powering, keying, adding VXO control, etc., are possible. They all reflect my original encouragement to think creatively on enclosures, shoot a photo of your handiwork, and share it with others via this column. I have reserved space for your photos and will award official Wild Woody WARC keys for the most uniquely enclosed Micronauts. Any takers? Oh, yes: Micronaut kits are $15 plus shipping ($2 regular mail, $3.50 priority mail). Send your order to me (Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210), and I will zip one back to you. Specify if you want an 80 meter (I will include a 3.58 MHz crystal), 40 meter, or 30 meter version (you add a crystal for your desired frequency).

An American Success Story

When Bruce Franklin, KG7CR, began seriously working with QRP, he realized a notable void in the area of an all-out QRP transceiver. Ten-Tec's Argonaut stood as a hallmark in low-power rigs, but its analog circuitry had been superseded by modern digital concepts. Newer "do it all" 100 watt transceivers could be re-

Photo 3– Inside view of Index Labs' main production facilities. Almost 2000 QRP dream rigs have emerged from this workshop near Seattle, in Gig Harbor, Washington.

Photo 4– A group of QRP PLUS transceivers undergoing final assembly. Three of those boards you see on the top shelf are stack-mounted in each rig.

Photo 5– Final checkout of each QRP PLUS includes checking various waveforms and evaluating transmitted signals on all bands. New owners anxiously await graduates.

Photo 6– Index Labs' new accessory box for the QRP PLUS. The unit features a wide-range antenna tuner, noise bridge, and rechargeable battery, and is enclosed in a transceiver-matching cabinet. (Details in text.)

duced to 5 watts, but it was not the same. Their high-current requirements discouraged battery-portable use, and cranking up the power if a contact was missed was too easy. Further, a true QRP rig (such as the classic Argonaut) should be lightweight and recognizable by its unique case. Bruce thus formulated the QRP PLUS transceiver and made a limited number of the rigs for himself and some friends. He never expected the QRP PLUS to become so extremely popular among low-power enthusiasts the world-over, but it did!

Previously, Franklin's Index Labs produced digital scan converters for ultrasound equipment used in the medical industry. That's right: it was just like an SSTV scan converter, except it utilized ultrasound's format and converted it to regular NTSC video. Bruce thus had the production facilities in operation, and when QRP PLUS orders boomed, he just regeared the assembly line accordingly (now you know why the QRP PLUS looks more like a laboratory instrument than an amateur radio rig).

During a recent conversation with Bruce, I suggested he treat *CQ* readers to a mini-tour of Index Lab's production facility. He agreed, and the photos of the tour are included here. Just seeing these little gems being assembled, aligned, and tested makes them even more attractive! During the conversation I also asked Bruce what we might expect to see emerge next from Index Labs. He told us production has now begun on a companion accessory box which contains an antenna tuner and a noise bridge plus a 4.5 ampere gel cell. The accessory box is shown in photo 6. It is the same size as the QRP PLUS, and the two units make a fully portable "use anywhere" station ideal for camping, emergencies, IOTA expeditioning, etc.

Use of a noise bridge rather than a regular SWR meter is a unique idea. First, there's the convenience of slipping it on and adjusting the tuner for minimum receive noise rather than squinting at a meter. The lowest noise is the lowest SWR; that's simple enough. Second, listening while adjusting eliminates the need for a flashlight when camping at night. Bruce says once you try "noise bridging," you will not go back to SWR metering, and that makes sense. Our hearty congratulations to Bruce and Index Labs on producing the right rig at the right time. Truly, it is an American success story!

You can reach Bruce at Index Laboratories, 9318 Randall Dr. NW, Gig Harbor, WA 98332.

Summary

That winds down Part II of QRP, gang, but stay tuned for another round of blow-out fun following on its heels. We are resurrecting those famous Sucrets box rigs from the 1960s and plan to feature both transmitter and receiver here next time. Meanwhile, let's QSO on 30 meters one weeknight soon. (I'm the weak one running QRP.)

73, Dave, K4TWJ

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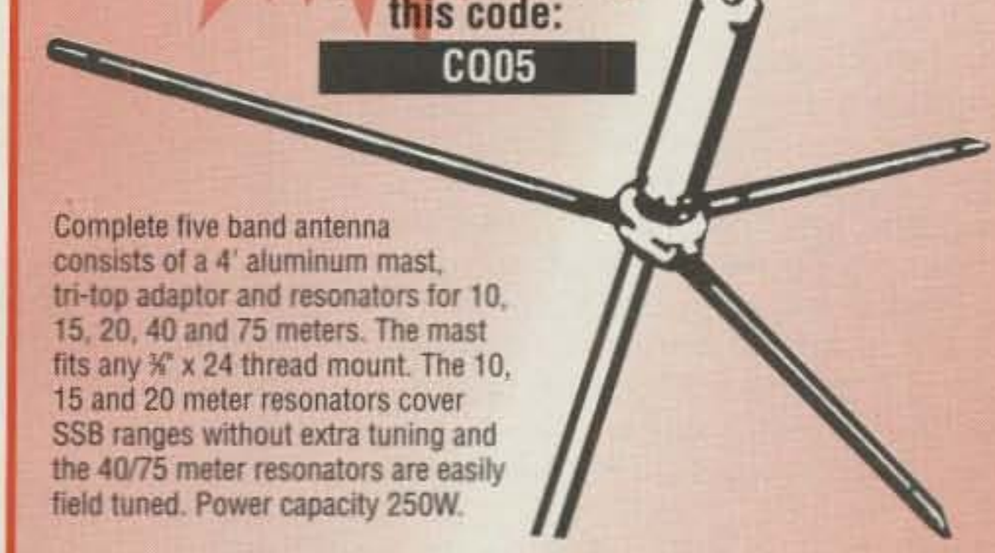

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AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

Recently, KF9FU and I had a conversation about county hunting. He had some interesting ideas, so I asked him to write something to share with the amateurs who are hunting counties. Carl's thoughts follow.

Off-Net County Hunting

By Carl Durnavich, KF9FU

While 14.336 and 14.056.5 remain the best source for counties, the hectic pace of a net, the many frustrations, and the fact such nets tend to take the challenge away gives birth to off-net county hunting—real *hunting*.

Once the '20 meter SSB net had 35 mobiles, 200 fixed chasing 400 awards. Well, it's no wonder no one in their right mind wants to be net control, and those brave souls who do often end up criticized at best and cruelly abused at worst. It's supposed to be a hobby, and some lose that joy on the net.

Off-net hunting offers a less hectic pace, with time to shoot the breeze and get to know and appreciate those who give you the county. Off-net hunting is a lost art which the original county hunters perfected. They had to hunt the bands, because a Sunday net list of mobiles might have had only five mobiles, if any. Now there are 3076 counties with active, fixed amateur operators and thousands capable of mobile operation who are not far from the rest of the counties. As a hunter sees sitting ducks, go for it!

Note: Those chasing awards that require QSLs will find return rates lower than when using the net. Mine is at 98% with the following steps:

1. Always include an SASE if you want the other station's card, *and* a prepared card requiring only signature in case they have no QSLs. A bit cheaper is to simply ask them to return the prepared card which is prestamped at the postcard rate.

2. In the QSO, if possible always ask, "Are you good in the call book?"

3. Ask if they will send you a card first. If they do, return and save the SASE, etc. If no response, try number one.

Sources of Counties

Contests. Over 30 state QSO parties exist annually as listed in *CQ*'s "Contest Calendar" column. The Pennsylvania and California QSO Parties usually have all counties available, while others vary. *Trick:* Don't simply hunt here; call CQ for the particular state and you may be surprised.

Field Day is an endless source of counties with over 2000 active yearly. Be sure to ask what county each station is in, as most are portable. *Tip:* If you need the county, ask the operator where to send the QSL. Many times these are clubs borrowing a callsign. The best bet is to QSL to the operator's home call.

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e-mail wa3rty@epix.net

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James T. Wade, VE9DH
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USA-CA All Counties #917
January 7, 1997

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WB8RJW	2949
WWØG	2950
N3TA	2951
SP2JKC	2952
LU5HEN	2953
JT1BG	2954

1000

VE9DH	1325
KCØIA	1326
WB8RJW	1327
WWØG	1328
SP2JKC	1329
LU5HEN	1330

1500

VE9DH	1190
KCØIA	1191
WB8RJW	1192
WWØG	1193
AA1KS	1194

2000

VE9DH	1095
KCØIA	1096
WB8RJW	1097
WWØG	1098

2500

VE9DH	1023
KCØIA	1024
WB8RJW	1025
WWØG	1026

3000

VE9DH	930
KCØIA	931
WB8RJW	932
WWØG	933

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801 USA for $2.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Award Manager, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

There are other contests to pad the book, but the above contests alone easily offer a shot at 2500 counties.

Traffic Nets. The ARRL Net Directory is a must here. Almost every state has nets daily. These are business-first nets, pleasure later, so listen to each for protocol. Each will accept any out-of-state checking at a certain time. Net controls make a list of checking. Those with computer programs that pop up the county of fixed stations can check needs, while others will have to use a combination of the call book and the Post Office Directory or maps to check needs. Typically, one checks in stating "no traffic" and "if possible informal later." Informal would be a county contact. Usually the same folks check in weekly here. Those seeking one or two counties should query for these specifically during the "informal." If the station is not present, others may be able to get that station for you. Again, do not come in demanding counties here. These are business-first nets.

Tip: Ask the net control if a net list is available. Nebraska has two such lists with some 40 odd counties as regular checking!

Other Nets. The Net Directory again is the source. Here too listen first and respect their protocol. Ever try the Bicycle Mobile Net? I've worked 100 odd counties bike-to-bike! The RV nets may be a source of vacationing mobiles. Endless possibilities exist here. Understand some nets are hostile to county hunters. *Tip:* Again listen and then check in without mentioning counties and pleasantly attempt to work your needs. Busy nets such as Eastcars, Midcars, etc., should simply be left free, as their pace can become hectic. And yes, nets exist in Alaska and Hawaii!

Ten Meters. This is undeniably the greatest source of counties and mobiles of any band, depending on propagation. A favorite mobile hangout is 28.345. Ten-Ten International has over a hundred local chapter nets with well over 500 counties checking in. It's best to join Ten-Ten, as this will make you more attractive to the many award hunters there and a number of county awards exist. *Tip:* When the band is open, simply pick a spot and call CQ for counties and mobiles. Tell the mobiles to call again if they hit a new county.

160 Meters. This band is a great source of the more rare rural counties. The ARRL and *CQ* 160 meter contests each winter fill the band. Many unlisted nets exist here; merely check in and join the ragchew and get the signal reports back and forth *a la* "I'm checking out my antenna." Some do not like county hunters; some do. If they don't know, they won't be able to react. *Tip:* Simply start at the bottom and politely break every QSO for a signal report while "testing" your antenna on noncontest days.

Computer Programs. A few computer programs exist which list counties in various formats. *Danger:* All FCC data and call books and programs are based on *mailing addresses*, not station location. Always ask the fixed station what county they are in; the authority is the horse's mouth and their QSL, not the computer programs!

Programs are useful when you need a few in a state. As an example, I needed two in Illinois, and one program listed 15 fixed stations in that county. I chose two or three of the newer General class callsigns, as they tend to be more

Say You Saw It In CQ

The Frankford Radio Club 70th anniversary award for contacting club members in 1997.

active. I wrote to them for a sked. (When I'm desperate, I try directory assistance and call. If they are not active, they may know who is, so I put that in every letter/call.) The other county had only two Technicians, so I scanned the nearby counties and maps and found four active Generals or better who were within 5 to 10 miles of the needed county. Luckily one had a mobile and was more than happy to get the county. The others had died years ago, were inactive, or thought I was nuts. You can't win 'em all.

The Info Highway. From packet to the Internet, one must be creative to advertise county needs or hunt for counties. A stop by the 14.336 County Hunters Net may provide the latest here. One individual is trying to access all counties via packet!

Yourself Plus One. Two handie-talkies and another amateur in the car means automatic county as you travel. To be legal for all awards, stop safely and work the other amateur, who stands outside the vehicle. If you do not use handie-talkies, portable low-band rigs and a motorcycle battery work well.

Repeaters. If you are alone while traveling, repeaters are helpful. Most county awards will not recognize repeater contacts, but nothing is wrong in keying up each and asking if someone in your needed county is listening. Simply move off to simplex frequency for a legal contact, or drive to the person's house for the county and coffee. Mapbooks and repeater directories are available.

Super-Rare Counties. Kalawao, Hawaii has no resident amateurs at last glance, and countacts mainly are obtained by vacationing mobile county hunters and groups which operate portable. A check of the 14.336 net will give you the latest here, as well as the rarer Dukes and Nantucket in Massachusetts (which have resident amateurs). *Tips:* These "island" counties have been run on the IOTA nets apart from county hunters. 14.260 is the main IOTA frequency. The Second District in Alaska has fixed amateurs, but they often are hard to snare for a schedule; try and try again here.

Sources of Off-Net Info. The following are good sources of off-net information.

County Programs: K4HAV has a program via zip codes. Check Buckmaster ads in *CQ, QST,* etc. For the latest programs check on 14.336.

Ten-Ten International: Info packet for $1, two first-class stamps, and address label to: KF7ZQ, Mike Elliot, 9832 W. Gurton Court, Boise, ID 83704-4080.

ARRL: For the Net Directory and Repeater Directory, contact the ARRL, 225 Main Street, Newington, CT 06111.

Post Office Directory: Obtainable from any U.S. Post Office, or National Five-Digit Zip Code Directory Orders, National Customer Support Center, USPS, 6060 Primacy Parkway Ste 101, Memphis, TN 38188-0001 (typically around $18).

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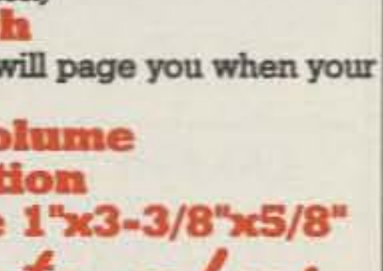

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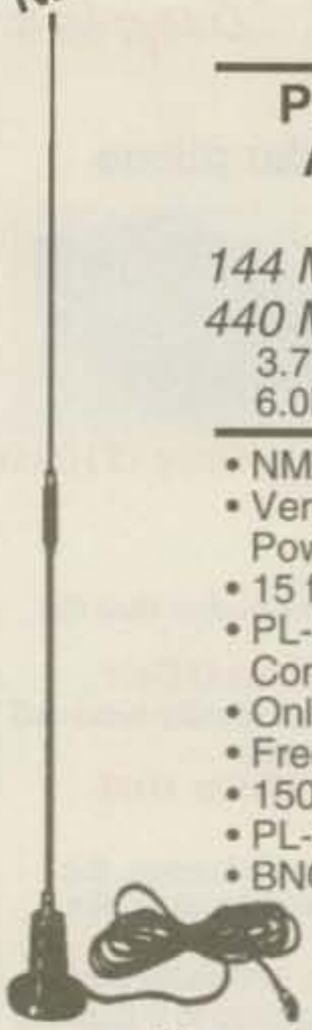

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UG-21D/9913	N Male for RG-8 with 9913 Pin	4.00
UG-21B/9913	N Male for RG-8 with 9913 Pin	6.00
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USA-CA 1000: James Wade, VE9DH; William Lang, KCØIA; Guy L. Hardy, WB8RJW; Gerald R. Grasso, WWØG; Richard C. Emmert, AA1KS; David M. Berish, N3TA; Krzysztof Maciejkiewicz, SP2JKC; Neldo Nestor Martin, LU5HEN; S. Bator, JT1BG.

USA-CA 1500: James Wade, VE9DH; William Lang, KCØIA; Guy L. Hardy, WB8RJW; Gerald R. Grasso, WWØG; Neldo Nestor Martin, LU5HEN; S. Bator, JT1BG.

USA-CA 2000: James Wade, VE9DH; William Lang, KCØIA; Guy L. Hardy, WB8RJW; Gerald R. Grasso, WWØG.

USA-CA 2500: James Wade, VE9DH; William Lang, KCØIA; Guy L. Hardy, WB8RJW; Gerald R. Grasso, WWØG.

USA-CA 3000: Larry Cahoon, WD3P; James Wade, VE9DH; William Lang, KCØIA; Guy L. Hardy, WB8RJW; Gerald R. Grasso, WWØG.

On A Personal Note

The last few months of 1996 were rather hectic for me. I was in and out of the hospital until they finally decided that there wasn't much

point in continuing to use the balloon angioplasty to open my coronary arteries. They decided to do it right! I had a double coronary artery bypass in early December (just like Russian President Boris Yeltsin).

I usually try to use humor to get over the difficult times, so I wrote the following as a humorous tribute to the folks who took care of me in the hospital. I hope you enjoy reading it as much as I enjoyed writing it.

I was scheduled for one of those stress tests. As usual, I thought I knew all the answers and watched television Monday evening. On Tuesday I arrived just in time for the test (something called a Thallium Stress Test). I thought Thallium was just another form of multiple choice (guess). Boy, was I ever wrong! I only got seven answers correct (read seven minutes). The professor (cardiologist) was quite upset and disappointed. She said she was going to have to keep me overnight and give me another chance on a different test the next day.

She told me she would give me a Catherization Test. I thought that was a true/false, and was sure that I could beat the odds on this one. After all, you have a 50–50 chance even if you can't read/understand the questions.

Wednesday morning came, and I went into the examination room. The darn test wasn't true/false, but was some kind of new-fangled fill-in-the-blanks and matching phrases and concepts. Needless to say, I flunked again. The cardiologist said she gave up and would turn me over to another teacher.

This teacher (cardiac surgeon) said she thought some serious measures needed to be taken, since I appeared to be such a recalcitrant student. She said something about *bypassing*. I thought that this was perhaps a new teaching method. You just infuse the student with whatever knowledge you want him to learn. She was too busy to discuss this further, so I had to stay over another night.

Thursday morning came. I wasn't aware of a thing. I guess I was sleeping. (I had developed that ability rather well in classrooms.) I woke up in a strange room with a mask on my face and some strange, demented person screaming, "Breathe . . . take a deep breath." Take a deep breath? I couldn't even breathe, let alone take a *deep* breath.

Well, finally the next Tuesday, one week after the first failed test, I was tested again and passed with an A+. Amazing, this new bypass educational system. Only one problem was left: They put me under house arrest for the next four weeks. I understand it has something to do with my system adapting to the all the new knowledge I had acquired.

One morning two weeks later I had a strange feeling. I called the teacher and told her about it. She said to have someone drive me over to a colleague. Well, it turned out to be a minor glitch in the system—something called fibrillation. They explained that it was something like a two-cylinder motor and one of the cylinders was misfiring. They fixed that pretty quickly.

Seriously, I'm now feeling better than I have in a long time and am very grateful to the folks at Robert Packer Hospital/Guthrie Clinic, in Sayre, Pennsylvania for their skill and caring.

See you next month!

73, Norm, WA3RTY

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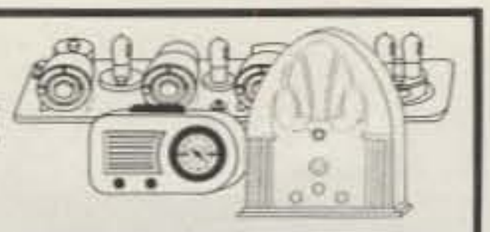

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CIRCLE 83 ON READER SERVICE CARD

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Managing The Art of Contest Courtesy

March's Contest Tip Of the Month

Have you checked the direction of your antennas and compared them to what your rotator is telling you lately? During the last CQ WW Contest I spent most of the first day using a 3-element 40 meter beam that was 40 degrees off its proper alignment. A short walk out back can add dBs to your signal by deploying a little attention to detail. Forgetting the obvious will almost always lower your score!

There is not a contester (starting with me) who can avoid admitting guilt to some of the topics I'm raising this month. The issue at hand? Our operating practices. I'd like to break up our operating styles into several categories and leave you thinking about how they apply to you. Hopefully, you'll feel committed, as I am, to helping clean up our "operating" act in the heat of battle.

Echo-Echo

Ah, yes. The last two letters of your callsign (or was it first three, year of birth, zip code?). Few know where this operating technique came from and many more know where they would like it to go. Although the temptation to go on a rampage here is extreme, the simple fact is that in nearly every case, signing the last two letters of your callsign in a pile-up slows down the other operator. There is nothing more frustrating during a fast run than to have a 59+40 station cover a pile-up with the pronouncement "ALPHA BRAVO," requiring you to ask for an unnecessary fill on his callsign. Many outstanding operators have taken an extreme position on this style of operating and simply won't respond to stations that don't sign what's printed on their license.

Now to be fair, there are times when a DX station requires you to operate in this manner. Once in the 1972 CQ WW SSB Contest it was rumored that someone heard "ALPHA RADIO" being broadcast (of course I was WA2LQZ at the time, so it had to be someone else!). My advice is simple. Just sign your callsign the way it was given to you. That's the way it was intended, just as you give someone your phone number, Social Security number, or last name. It makes no more sense to sign a partial callsign than it does to give the last four digits of your credit-card number when ordering a product over the telephone!

Calling . . . Calling . . . Calling

This is a special favorite of mine, and we've all done it. Recall those 80 meter Pacific pile-ups from the East Coast. And then there's that 14204 fracas with W8XXX/HR2 (hope that's not a new vanity call!) at the end of a long CQ WW Contest. Sometimes contesters get carried away. We become so compelled to get that "double multiplier" that we call and call and call again. The fact is, many DX stations can't handle it. Over the years I've asked some casual DX stations about the troubles they encounter while operating. Unlike the fringe-oriented contester, most stations in rare DX locations have turned on the radio, unknowingly finding a DX contest in progress. The attempt they make to work guys under those conditions is largely to provide a service to the serious operator. In their minds, this activity could just as easily be replaced by a trip to the local beach. That's a point worth remembering!

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Calendar of Events

Feb.	21-23	YL-OM YLRL CW QSO Party
Feb.	**21-23**	**CQ WW 160 Meter SSB Contest**
Feb.	22-23	REF SSB Contest
Feb.	22-23	U.B.A. CW Contest
Mar.	1-2	ARRL SSB DX Contest
Mar.	8-10	QCWA SSB QSO Party
Mar.	9-10	Wisconsin QSO Party
Mar.	14-15	CLARA HF CW Contest
Mar.	15-16	Bermuda Contest
Mar.	15-17	Virginia QSO Party
Mar.	18-19	CLARA HF SSB Contest
Mar.	**29-30**	**CQ WW WPX SSB Contest**
Mar.	31	Low Power Spring Sprint
Apr.	5-6	EA RTTY Contest
Apr.	10-12	DX-NA CW YL Contest
Apr.	12-13	Japan Int'l HF CW DX Contest
Apr.	24-26	DX-YL Int'l HF SSB Contest
Apr.	26-27	Helvetia (HB9) Contest
Apr.	26-27	Nebraska QSO Party
May	3-4	ARI International DX Contest
May	**24-25**	**CQ WW WPX CW Contest**

The W9-Bravo Station Go Ahead

How many times have you heard a DX station say "the W9-Bravo station . . . 5936" followed by three or four stations in another call area dumping in their calls. The excitement of the moment often gets the best of us. I equate this scenario to someone calling your "number 34" at the service desk of a car dealership and experiencing six people with other numbers running to the desk to beat you. Skilled operators such as contesters are simply better than that.

Frequency in Use?

I recently read an article detailing the history of telephony (AM + SSB). In particular, the author speculated as to the content of the first phone message. Although none of us will ever know for sure, he was quick to point out that we can assume history's second transmission had to be "frequency is in use." Another old favorite comes from Bill Gioia, K2EK, who defines "QRL?" as "WARNING, I will be calling CQ in approximately 30 nanoseconds."

Simply put, how much do we really check to see if a frequency is in use? The approach to this point varies from one or two dits on CW to three or four honest attempts for ownership on SSB. The result is at least one ensuing battle each contest with someone who thought he was there first.

There really are two kinds of operators to consider. There are the guys who expect a 10 kHz swath of clarity on 20 meters SSB. And there are others who respect the reality of crowded conditions (especially around band edges) and merely want a little breathing room. My experience has shown that most everyone will move if they feel there is any question of frequency ownership. Fewer of us are making that genuine attempt to check before we get started, and more important sometimes hold the opinion of the "non-contester" with lower regard.

To be fair to contesters for a minute, I also have to point out the increasing problem of net operations colliding with contest activity. Like it or not, there's nothing in our FCC Part 97 that allocates a specfic frequency to an individual or group. Put another way, this isn't the FM broadcast band. How many times have you been run off a frequency that you were rightfully using in a contest because a group has met there at 1200Z for over 20 years? A corollary to this point is the net operation that feels they must have a 10 kHz clear-channel swath around their frequency to operate effectively. The FCC has a pretty clear position on this: All they really want is for the children to play well with each other! That responsibility lies with contester and non-contester alike.

Contesters are and will remain the most proficient group of operators amateur radio can offer. As we enter the second half of this year's contest season, let's think about our balance of operating courtesy versus aggressiveness.

Final Comments

Although I had planned on reporting the results of last year's *CQ* Contest Survey this month, there were enough foreign responses still coming in that I decided to wait one more month.

One of the more general comments I've received lately has to do with your desire to read more personal stories about other contesters, including the "little guy." Over the ensuing months I hope to deliver what you've asked for.

In the "planning ahead" stage, we have several corrections to bring to your attention. *CQ*'s Amateur Radio and Radio Classics Calendars for this year have the wrong dates for the ARRL contests in June. This year's ARRL VHF QSO Party will be held the weekend of June 14–15, 1997, and the ARRL Field Day will be the weekend of June 28–29, 1997, so plan accordingly!

That's it for this month. As always, be sure to submit your contest announcements for June *CQ* to me by April 1.

73, John, K1AR

Say You Saw It In CQ

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., Mar. 9–10

This popular party is a shorty, only 7 hours, and it is again sponsored by the West Allis Radio Amateur Club. The same station may be worked on each band and mode, and mobiles in each county change. Wisconsin stations may contact other in-state stations for QSO and multiplier credit. Only one transmitter on the air at the same time.

Classes: Single operator and multi-operator and transmitter, both fixed and mobile. Novice/Tech, both single and multi-operator.

Exchange: RS(T) and QTH. County for Wisconsin; state, province, or country for others.

Scoring: Phone QSOs count 1 point; 2 points for CW. Wisconsin stations multiply total QSO points by (U.S. states + VE provinces + Wisconsin counties) worked for their final score. DX contacts count for QSO points only. Others use total Wisconsin QSO points by the number of Wisconsin counties worked (maximum of 72).

Wisconsin mobiles can add a bonus of 500 points to their final score for each county outside their own from which they operate (minimum of 15 QSOs from each county).

Frequencies: CW—3550, 3705, 7050, 7125, 14050, 21150. SSB—3890, 7230, 14290, 21350, 28400.

Awards: Awards will be sent to the highest scoring single operator

in each class in each state and province. *Wisconsin:* The top 10 single operator scorers in each class will receive awards as well as highest multi-operator in each class and the highest aggregate club score. Logs with more than 100 QSOs must include a separate dupe sheet for each mode with their entry.

Complete rules and entry forms are available from the following address. Please be sure to include an SASE with your request. Deadline for logs is March 31st, and they go to: West Allis RAC, P.O. Box 1072, Milwaukee, WI 53201.

CLARA & Family HF Contest

CW: 1700Z Fri. to 1700 Sat., Mar. 14–15
SSB: 1700Z Tues. to 1700 Wed., Mar. 18–19

This is the 30th anniversary of the CLARA Contest. It is open to YLs and OMs around the world on phone and CW on all HF bands. Each station may be contacted twice per band mode.

Classes: Single operator, all bands.

Exchange: Name, RS(T), QTH (Canadian province/DXCC country), and CLARA membership status (yes/no).

Scoring: CLARA-CLARA QSOs are worth 5 points; CLARA-YL QSOs are worth 3 points; CLARA-associate OM QSOs are worth 2 points; CLARA-OM QSOs are worth 1 point.

Multiplier: Canadian provinces and DXCC countries.

Final Score: Multiply total QSO points times multiplier.

Awards: A variety of trophies and certificates will be awarded to high-scoring CLARA members, non-members, and OMs.

Send your entries no later than April 11th to: Jeanne Gordon, VA3WX, 478 Donegal Drive, Burlington, ON L7L 2M7, Canada.

Bermuda Contest

0001Z Sat. to 2400Z Sun., Mar. 15–16

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open to all licensed amateurs. Activity will be on the 3.5, 7, 14, 21, and 28 MHz bands on SSB and CW. Cross-band or cross-mode contacts are not permitted. You are limited to 24 hours out of the 48-hour contest period. Off times of no less than two consecutive hours must be clearly indicated in the log. Participation is for single operator stations only, and previous winners are no longer restricted from official entries in the contest.

Exchange: RS(T) only.

Scoring: Five points for each QSO. A station may be worked on SSB and CW, but you may not take credit for an additional multiplier. Final score is the sum of QSO points times the number of countries on each band multiplied by the number of different VP9 stations worked on each band. (*Note:* It's each VP9 station, not each parish.)

Awards: Certificates will be awarded to the top-scoring station in each country (minimum of 100 QSOs and 3 VP9s). The overall worldwide winner will receive a trophy. *Note:* The free trip to Bermuda for the top-scoring entrant will be provided this year by the Bermuda Department of Tourism. In addition, accommodations will be given by the Palmetto Bay Hotel.

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excessive number of claimed duplicates means disqualification. The usual signed declaration is also required.

Entries must be **received** no later than June 1st by the Radio Society of Bermuda, Box HM275, Hamilton HM AX, Bermuda. Enclose 4 IRCs for acknowledgement of receipt.

Virginia QSO Party

1800Z Sat. to 0500Z Sun., Mar. 15–16
1100Z Sun. to 0200Z Mon., Mar. 16–17

This is the 22nd year the Sterling Park ARC has sponsored this party. The same station may be worked on each band and each mode for QSO credit. VA stations may work other in-state stations for QSO multiplier credit, and VA mobiles in each county change.

Classes: Single Operator, Single/Multi-Operator Mobile, Club, Multi-Operator Single/Multi-Transmitter.

Exchange: QSO number starting with 001 and QTH. County for VA; state, province, or DX country for others.

Scoring: Credit one point for each SSB contact; two points for CW; three points for working a VA mobile. VA stations multiply total QSO points by sum of US states, VE provinces, DX countries, and VA countries. Others multiply total VA QSO points by the number of VA counties worked (maximum of 95). Mobiles add to this the bonus points for Virginia counties in which QSOs were logged.

Frequencies: CW—1805 kHz and 50 kHz up from low end of 10, 15, 20, 40, and 80 meter bands. SSB—1845, 3860, 7260, 14260, 21360, and 28360. Also Novice bands (10 kHz up from bottom of Novice sub-band and 28360).

Awards: Certificates to top scorers on each state, province, DX country, and VA county. There are a variety of plaques available to category winners.

Logs: Indicate each new multiplier in a separate column as it is worked. Include a summary sheet showing the scoring and other pertinent information.

Mailing deadline for all entries is April 15th to: Virginia QSO Party, Call Box 599, Sterling, VA 20167.

CQ World-Wide WPX Contest

SSB: Mar. 29–30 CW: May 24–25
0000Z Sat. to 2400Z Sun.

Complete rules were published in the January issue. The following are a few points to keep in mind. You may operate 36 hours out of the 48-hour contest period as a single operator station. Off-times must be a minimum of 60 minutes in length. Multi-op stations can operate the full 48 hours.

The definition of the prefix multiplier is spelled out in detail, but consider a prefix to be the letter/number combination which forms the first part of a call. The multiplier is determined by the number of different prefixes worked and is counted *once* only, regardless of how many times it is worked on other bands.

Another point to keep in mind is that in the multi-operator single transmitter category, only one transmitter and only one band may be used during the same 10-minute period. Picking up a new multiplier on another band during the same time period is prohibited.

An alphabetical/numerical check list of claimed prefixes is a requirement and must be included with your log. Note that contest logs may be submitted on disk (MS-DOS compatible) in standard ASCII or .bin, .res, .dbf, or .wks formats. To reduce the administrative burden, please label your computer entries with a unique name (e.g., N8BJQ.BIN). Also, you may now submit your logs electronically (in MIME or UUENCODE format) to <sdb@ag9v.ampr.org> or <n8bjq@erinet.com>.

Deadline for submitting your SSB entry is May 10th, and July 10th for the CW section. **Be sure to indicate SSB or CW on the envelope.** All logs go to: CQ Magazine, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

Questions pertaining to the WPX Contest can be sent to the WPX Contest Director, Steve Bolia, N8BJQ, 4121 Gardenview Dr., Beavercreek, OH 45431 or via <n8bjq@erinet.com>.

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DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

The More Wanted Countries

For the past 17 years, *The DX Bulletin* has surveyed the most active and accomplished DXers in the world to determine the Most Wanted countries. DXers eagerly await publication of this Most Wanted survey, as many DXpeditioners base their plans on it. The 1996 Most Wanted survey (which may be the last of its kind; see below) is published in the January–February 1997 issue of *The DX Magazine,* which is available for $2.00 from DX Publications, P.O. Box 2306, Paducah, KY 42002.

For those who can't wait to see the results, the Most Wanted country in 1996 was **North Korea P5**, a country that only a handful of DXers have confirmed.

The 1996 Most Wanted survey featured an expanded list of countries, beyond the usual 100. This survey permits us to look at the *More* Wanted countries—those not in the top 100, but still wanted by some of the top DXers. The More Wanted countries probably reflect the "need" list for DXers with 150–200 countries confirmed. These countries, in between the easiest-to-work DXCC countries and those on the Most Wanted list, provide some interesting opportunities for casual DXpeditioners and contest teams. Let's see what we can learn from the 1996 More Wanted list.

First, two countries that were the number one Most Wanted countries have now fallen in demand to the More Wanted list. **China BY** and **Albania ZA** topped the Most Wanted lists in the 1980s; today they rank 113th and 134th on the More Wanted list, demonstrating good things happen to patient DXers. Some of the More Wanted countries are readily accessible in Europe. European DXers can easily reach the **Vatican HV, Andorra C3, Liechtenstein HBØ, Aland Island OHØ,** and **Madeira CT3**. Some of the other More Wanted countries are in Africa, within relatively easy reach of US and European DXpedition DXers: **Djibouti J2, Cameroon TJ, Rwanda 9X, Niger 5U, Guinea-Bissau J5, Swaziland 3DA, Sao Tome S9, Tanzania 5H, Algeria 7X, Angola D2, Zambia 9J, Lesotho 7P, Malawi 7Q, Mozambique C9, Cape Verde D4, Sierra Leone 9L, Zimbabwe Z2, Zaire 9Q, Ghana 9G, Liberia EL,** and **Gambia C5.** I've operated from both the Gambia and Sierra Leone at sunspot minimums and can recommend the good propagation from western Africa.

Several other countries on the More Wanted list are within reach of a well-

P.O. Box 50, Fulton, CA 95439

Lily, YO9FVU, uses amateur radio to help get medical supplies for Romania. She also works with the local Red Cross. Lily runs the Cimpina club station, YO9KPB. (Thanks to WA2AUF for the photo.)

Kan, JA1BK, DXer of the Year at the 1996 New Orleans International DX Convention, accepts his award from Mike Mayer, W5ZPA, president of the NOIDXC. The 1996 NOIDXC is August 22–23 at the Royal Sonesta Hotel in the New Orleans' historic French Quarter.

The RZ4FWA radio club operators include (standing) Yuri, UA4FAT; Vit, UA4FAR; Oleg; Ratko, Z31LR; Oli, Z32TO; and Jakov, RW4FW. Sitting are Natasha; Oleg, UA4FBP; and Vlado, Z32KV.

THE MORE WANTED "NEED" DX LIST

101	Djibouti	J2	118	St. Paul I.	CY9	135	Malawi	7Q
102	Juan Fernandez	CEØZ	119	Sable I.	CY	136	Liechtenstein	HBØ
103	Georgia	4L	120	North Cook Is.	ZK1	137	Mozambique	C9
104	Cocos I.	TI9	121	Sao Tome	S9	138	Cape Verde	D4
105	Niue	ZK2	122	Andorra	C3	139	Sierra Leone	9L
106	Desecheo	KP5	123	Mauritius	3B8	140	Zimbabwe	Z2
107	Cameroon	TJ	124	Tanzania	5H	141	Zaire	9Q
108	Rwanda	9X	125	Chagos	VQ9	142	Johnston I.	KH3
109	Niger	5U	126	Algeria	7X	143	Pitcairn I.	VR6
110	Midway I.	KH4	127	Papua N. Guinea	P2	144	Ghana	9G
111	Guinea-Bissau	J5	128	Revillagigedo Is.	XF4	145	Liberia	EL
112	Vatican	HV	129	St. Helena	ZD7	146	Aland Island	OH0
113	China	BY	130	Saudi Arabia	HZ	147	Gambia	C5
114	Navassa I.	KP1	131	Angola	D2	148	Guyana	8R
115	Sri Lanka	4S	132	Zambia	9J	149	Guadeloupe	FG
116	Nauru	C2	133	Lesotho	7P	150	Madeira Is.	CT3
117	Swaziland	3DA	134	Albania	ZA			

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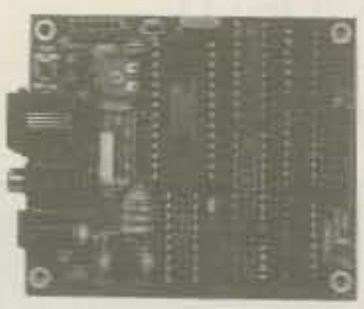

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The WPX Program

SSB

2619 ..... CT1EKD
2620 ..... IK2MKM
2621 ..... JA3ETD

CW

2937 ..... DF8MW
2938 ..... JA7GUT
2939 ..... JE5AID
2940 ..... AE5B

Mixed

1769 ..... DF8MW
1770 ..... EA5BHK
1771 ..... EA3AOK
1772 ..... N6PEQ
1773 ..... IK2MKM

Mixed: 450 DF8MW, EA5BHK, EA3AOK, IK2MKM, N6PEQ. 500 DF8MW, EA5BHK, EA3AOK, N6PEQ. 550 DF8MW, EA5BHK, EA3AOK, N6PEQ. 600 DF8MW, EA5BHK, EA3AOK, N6PEQ. 650 DF8MW, EA5BHK, N6PEQ. 700 EA5BHK, IK2MMF, N6PEQ. 750 EA5BHK, IK2MMF, N6PEQ. 800 EA5BHK, IK2MMF, N6PEQ. 850 IK2MMF, N6PEQ. 900 IK2MMF. 950 IK2MMF. 1000 IK2MMF. 1050 IK2MMF. 1100 IK2MMF. 1150 IK2MMF. 1200 IK2MMF. 1250 IK2MMF. 1450 JA7FFN. 1600 AE5B. 1650 AE5B. 2600 IK2ILH. 2650 IK2ILH. 4400 IT9TQH. 4450 IT9TQH. 4500 IT9TQH. 4550 IT9TQH. 4600 IT9TQH. 4650 IT9TQH.

SSB: 350 CT1EKD, JA3ETD. 400 CT1EKD, OH9BCM, JA3ETD. 450 CT1EKD, JA3ETD. 500 CT1EKD, JA3ETD. 550 CT1EKD, VK4ARB. 600 CT1EKD. 650 CT1EKD, IK4SWX. 700 CT1EKD, IK4SWX. 750 IK4SWX. 800 IK4SWX. 850 IK4SWX. 900 IK4SWX. 950 IK4SWX. 1000 IK4SWX. 1050 IK4SWX. 1150 EA3BT. 1200 EA3BT. 1250 EA3BT. 1300 EA3BT. 1350 EA3BT. 1400 EA3BT. 1450 EA3BT. 1550 AE5B. 1940 K4CKS. 2000 K4CKS. 3500 F6DZU. 3550 F6DZU. 3600 F6DZU. 4400 IT9TQH. 4450 IT9TQH. 4500 IT9TQH. 4550 IT9TQH. 4600 IT9TQH.

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Complete rules and application forms may be obtained by sending a business-size self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to: "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

organized team of DXpeditioners. Possible targets include **Juan Fernandez CEØZ, Niue ZK2, Cocos Island TI9, Midway KH4, Sri Lanka 4S, St. Paul Island CY9, Sable Island CY, North Cook Islands ZK1, Mauritius 3B8, Papua New Guinea P2, Revillagigedo XF4, St. Helena ZD7, Guyana 8R, Guadeloupe FG.**

On the other hand, there are some countries on the More Wanted list which will probably move up into the Most Wanted list in the next few years, as the odds of putting them on the air are long. These include **Desecheo KP5, Navassa KP1,** and **Johnston Island KH3**. Government restrictions on travel to these US possessions suggest that DXers will have to wait at least a few years before making a contact. (In some years an amateur is among the crew stationed on Johnston, and some of them have been very active.)

DXpeditioners should find plenty of possible targets on the 1996 More Wanted list.

Changes in DX Publications

The end of 1996 saw some dramatic changes in the area of DX publications. Both *The DX Bulletin* and *The Long Island*

CQ DX Awards Program

SSB

2213 ..... GM4XLU
2214 ..... IK2MKM

CW

953 ..... KP4QL

SSB Endorsements

320 ..... W7OM/328
320 ..... DU9RG/328
320 ..... W6DN/328
320 ..... VK4VC/328
320 ..... WB3DNA/326
320 ..... 4N7ZZ/324
320 ..... VE2GHZ/322
310 ..... GM4XLU/310
275 ..... LU3HBO/289

CW Endorsements

320 ..... W6DN/328
310 ..... 4N7ZZ/316
300 ..... W3II/308
275 ..... G4MVA/294

Total number of active countries is 328. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

The WAZ Program

Single Band WAZ

15 Meter SSB

501 .....KA1DIG

20 Meter SSB

994 .....BV8BC 996 .....YU7YZ
995 .....NKØS

40 Meter SSB

84 .....F6CPO

15 Meter CW

268 .....I7PXV

17 Meter CW

21 .....F3TH

20 Meter CW

471 .....JA9IFF

160 Meter WAZ

106 ...WA2UUK .....31 Zones .....New
107 ....DL1RWN .....33 Zones .....New
108 ....DL1YD .....40 Zones .....New

All Band WAZ SSB

4365 .....CT1ESO 4367 .....IK8HJM
4366 .....IK8VRH

CW/Phone

7716 .....NW7E 7719 .....F5OIU (CW)
7717 .....WA6TDX 7720 .....IKØGRS
7718 .....F5XX

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

DX Bulletin (also called *The Biweekly DX Bulletin* and *The DX Reporter*) ceased separate publication in December. This concluded a run of nearly 30 years of *The DX Bulletin* being one of the top two DX newsletters in the world and by far the mostly widely read. *The Long Island DX Bulletin* was the oldest DX newsletter in the US and the least expensive. It had long been the DX newsletter of choice for the beginning DXer.

The reason why these two eminent DX newsletters ceased publication was due to changes in the job responsibilities of editor Paul Smith, AE4AP. Extensive foreign travel precluded his continuing the rigorous grind of weekly and biweekly publishing deadlines.

The two periodicals have been merged with *The 59(9) DX Report*. Outstanding subscriptions will be honored with subscriptions to the aforementioned. *The*

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M1860A	60ft, M-18 15 sq ft, 87 MPH w/Hazer 7	$3195.00
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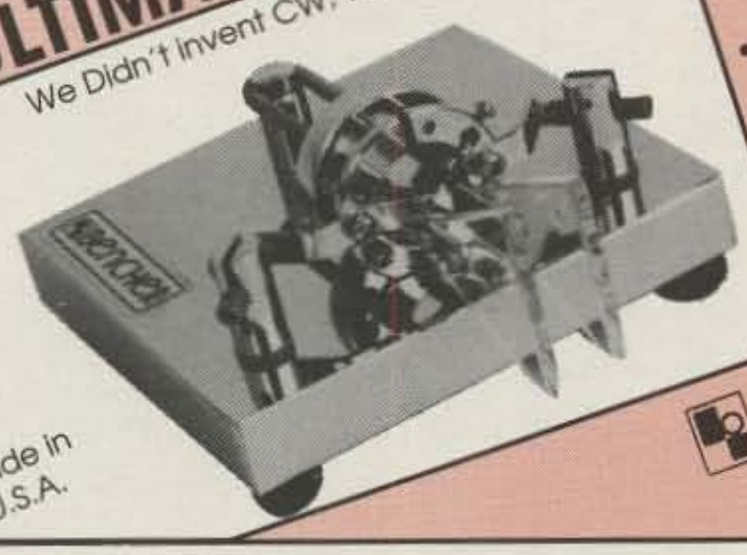

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CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Currently there are 328 countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

CW

K2TQC 328	K3UA 327	W9WAQ 326	I1JQJ 325	DL3DXX 322	I4LCK 317	N6AW 311	WA4DAN 301	9A2AJ 289
K1MEM 328	N7MC 327	AA4KT 326	IT9VDQ 325	W1WAI 322	N6CW 316	OH3NM 310	HA5NK 301	DJ1YH 288
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NI4H 320								

59(9) Report is produced weekly by Bob Nadolny, WB2YQH. You can contact the publication at P.O. Box 73, Spring Brook, NY 14140 (see the ad in *CQ*'s Ham Shop).

Carl Smith, N4AA, who publishes another DX newsletter, *QRZ DX*, has acquired *The DX Magazine* also from Paul Smith, AE4AP, who has divested himself from amateur radio publishing.

Other Sources of DX Information

This would be an excellent time for DXers to also turn to the Internet for DX news. The DX Reflector includes several electronic DX newsletters, as well as lots of DX tidbits, such as IOTA operations, etc. News on the Internet is far more timely than that of paper newsletters, and the price is right—free!

DXers can use the most basic of computers to access the Internet via electronic mail. You don't need a state-of-the-art Windows95 machine to use a free e-mail program such as Juno to receive messages. You may be able to find older computers going for very low prices, as the real computer buffs upgrade their hardware on a regular basis to stay current with the new, hardware-intensive programs. Given the rapidly growing role that the Internet is playing in DXing, this sunspot minimum would be an excellent time for the intelligent DXer to include Internet prowess among other DX skills.

In other DX publications news, *The GO-LIST* has a new home: John Shelton, WB4RRK, P.O. Box 3071, Paris, TN 38242 (phone 901-641-0109; fax 901-641-0110). The new telephone number of the G)-BBS is 901-641-0230. This remains the best source of up-to-date, accurate QSL information.

The Digital Journal, the voice of the In-

Say You Saw It In CQ

5 Band WAZ

As of November 30, 1996, 449 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

SM5FQQ

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	HA8IB, 199 (2 on 15)
AA4KT, 199 (26)	DK1FW, 199 (31)
K7UR, 199 (34)	OH2DW, 199 (1)
NAØY, 199 (26)	IK1AOD, 199 (1)
WØPGI, 199 (26)	DF3CB, 199 (1)
W2YY, 199 (26)	UA3AGW, 198 (1, 12)
W9WAQ, 199 (26)	VO1FB, 198 (19, 27)
W1JR, 199 (23)	EA5BCK, 198 (27, 39)
VE7AHA, 199 (34)	KZ4V, 198 (22, 26)
W1FZ, 199 (26)	K4PI, 198 (23, 26)
IK2GNW, 199 (1)	G3KDB, 198 (1, 12)
W9CH, 199 (26)	DK2GZ, 198 (1, 24)
ACØM, 199 (34)	KG9N, 198 (18, 22)
IK8BQE, 199 (31)	KM2P, 198 (22, 26)
JA2IVK,199 (34,40m)	GM3YOR, 198 (12, 31)
K1ST, 199 (26)	DKØEE, 198 (19,31)
ABØP, 199 (23)	KØSR, 198 (22, 23)
KL7Y, 199 (34)	K3NW, 198 (23, 26)
UY5XE, 199 (27)	WB6OKK, 198 (22, 37)
NN7X, 199 (34)	S57J, 198 (2,26)
DL3ZA, 199 (31)	WR3E, 198 (23, 26)
OE6MKG, 199 (31)	UA4PO, 198 (1, 2)

The following have qualified for the basic 5 Band WAZ Award:

SM5FQQ, 200 Zones — K5MC, 152 Zones

Endorsements:

UA4PO, 198 Zones — WA2UUK, 194 Zones

1025 Stations have attained the 150 Zone level as of November 30, 1996.

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

ternational Digital Radio Assn. (IDRA), has gone to bimonthly to reduce costs. The IDRA is very effective in promoting digital modes. Their address is P.O. Box 2550, Goldenrod, FL 32733-2550 (phone 407-677-7000; fax 407-671-0194).

Other DX News

The 9th Call Area QSL Bureau has a new address: Northern Illinois DX Association (NIDXA), P.O. Box 1450, Woodstock, IL 60098-1450. Mail sent to the old box in Elmhurst, Illinois will be forwarded for about one year. Note also that when you get a new callsign under the FCC vanity callsign program, you will need to maintain appropriate bureau credits under *both* your old and new callsigns, as cards often take up to several years to work their way through the bureau system. More about this in a future column this year.

The Northern California DX Foundation has elected new officers. The new president is Len Geraldi, K6ANP. Bob Vallio, W6RGG, is vice-president; Tom McShane,

RADIO WORKS

CAROLINA WINDOM™ - New World Record

3,400,000 mile-per-watt on 40 meters. Fran Slavinski, KA3WTF and Paul Stroud, AA4XX do it again! The CAROLINA WINDOM 40 was the receiving antenna in two world records. Is it any wonder why the CAROLINA WINDOMs are the wire antenna choice of DXers and DXpeditions all over the world? The horizontal element, with the pattern and gain of a Double Zepp, plus the exceptionally low-angle radiation of the Vertical Radiator combine to produce an unequaled radiation pattern, which makes this a very high performance antenna for both DX and casual operation. 1.5 KW, feed with 50 ohm coax, transmatch is needed.

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CW 80	80-10, 132' horiz + 22' Vertical Radiator	$79.95

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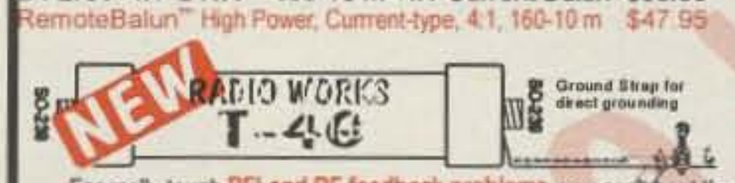
C1-2K	1:1	2KW	160-10m	Retrofit any ant.	$20.95
Y1-5K	1:1	5 KW	160-10 m	The YagiBalun™	$29.95
B4-1.5K	4:1	1.5KW	80-10 m	General Purpose	$22.95
B4-2KX	4:1	2 KW	160-10 m	4:1 Current Balun	$39.95

RemoteBalun™ High Power, Current-type, 4:1, 160-10 m $47.95



For really tough RFI and RF feedback problems, you can't beat the *new T-4 and T-4G* Ultra Line Isolators. The T-4 replaces the T-3, 4KRF-LI and 4KV-LI by combining the best features of each line isolator into one super device - and, the Isolation Factor is 50% higher. The T-4G goes even further with a built-in ground strap for direct Line Isolator grounding. Before coax enters your station, stray RF is shunted directly to ground. Stray RF hasn't got a chance, yet signal attenuation is zero! Use the T-4 when a direct ground path is not possible. Use with Vertical antennas. Install between transmitter and linear and between linear and tuner to break up ground loops. Enhance your beam's F/B ratio. Use the T-4 with any antenna to reduce feedline radiation. This is the Big GUN weapon in the fight against RFI.

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4K-LI	Identical to 4K-LIG without direct grounding	$19.95
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T-4	Identical to T-4G without direct grounding	$29.95

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N/9913S	As above but Silver & Teflon	$4.25
N-200	Silver-Teflon, installs like PL-259 SALE	$2.95
RG-8X	Premium grade, 95% braid, 1500 w	16¢
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RG-213 Plus	Enhanced, 95%+ super jacket	37¢
RG-213 Top Quality, 95%	SALE	33¢
ExtraFlex Flexible, 9913 type		59¢
R1 Rotator	8 conductor (2 x #18, 6 x #24) SALE	20¢
R2 Rotator	8 conductor (2 x #16, 6 x #18) SALE	35¢
R4 Rotator	8 conductor (2 x #14, 6 x #18)	47¢
#14 HD	Stranded, 7 x 22 hard-drawn	8¢
#13 CW	19-strand, copper-clad, insulated	16¢
#14 FlexWeave™	168-strand, bare for any wire ant.	12¢
#12 FlexWeave™	259-strand, excellent for longer runs	19¢
450 Ladder	#16 stranded cond, poly, windows	18¢
450 Ladder	New! #14 stranded cond. poly, windows	28¢
1/2" Braid	Tinned copper, for ground systems	65¢

Coax & cable must be in 50-foot multiples for ad prices. Quantity pricing, too.

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(from EA5EYJ, via 425 DX News)

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3DAØDX to WJ2O
3E1DX to KFØUI
3V8BB to YT1AD
4F2IX to DU4IX
4F3CV to HB9CZX
4F4IX to DU4IX
4L1BW to N3CBW
4L1DX to OZ1HPS
4M2BYT to YV2BYT
4S7EF to CBA
4V2A to 9A2AJ
4X/OK1JR to OK1AJN
4X1VF to K1FJ
4ZØZ to 4X6ZK
4Z4T to 4Z4UT
5H3CA to KBØOZG
5K6W to HK6KKK
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5NØT to F2YT
5N36T to F2YT
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9A7A to 9A1HDE
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NW6P, is secretary; Bruce Bulter, W6OSP, is treasurer; and the following are directors: Eric Edberg, W6DU; Jack Troster, W6ISQ; Dick Dievendoff, AA6MC; Rusty Epps, W6OAT; Dave Lesson, W6QHS; Steve Thomas, N6ST; and Lou Beaudet, K6TMB. Advisors to the NCDXF board are Jim Maxwell, W6CF; Merle Parten, K6DC; Bob Fabry, N6EK; Ron Steiner, K6KEO; Bob Ferrero, W6RJ; Al Lotze, W6RQ; Bud Bane, W6WB; and Howard Brainen, WZ6Z.

In addition to supporting major DXpeditions and playing a significant role in the multi-band IARU/NCDXF beacon program, the NCDXF maintains a library of

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Fred, PY7ZZ, recently worked his 200th zone for his 5-Band WAZ.

slide and video shows for loan to radio clubs. Contact Ron Steiner, K6KEO, at 3154 Dominic Drive, Castro Valley CA 94546-1938 for more information on this program. The NCDXF web site resides at <http://www.ncdxf.org>. The First Class Operators club recently awarded its Al Slater, G3FXB, Memorial Trophy to the NCDXF for the organization's role in DX-ing, contesting, operating standards, friendship, and encouraging others.

Finally, the Federal Communications Commission (FCC) is working toward implementing two international amateur radio licensing programs. The FCC issued a Notice of Proposed Rulemaking to implement the International Amateur Radio Permit, joining with Argentina, Canada, Peru, Venezuela, Uruguay, and Trinidad & Tobago. The ARRL hopes to be the agency that supervises the IARP in the US. The FCC is also working toward adherence to the CEPT agreement, which covers most European countries and a few other nations. A true international amateur radio license seems not only feasible, but actually obtainable in the near future. This can only help DXers.

5-Band Worked All Zones

Fred, PY7ZZ, recently received his *CQ* 5-Band WAZ Award. His last confirmation was with Zone 34 on 80 meters. Fred has been licensed since 1969 and is very active, having worked all DXCC countries (except for North Korea) on both 15 and 20 meters! In fact, he has worked all but Heard Island on 10 meters and only lacks three countries on 40: Bhutan, Heard, and Nepal. His 40 meter antenna is a dipole, showing that even modestly equipped DXers can still enjoy considerable DX success. Fred also give out DX contacts during regular trips to Fernando de Noronha, PYØF, where he operates under the call PYØFZ.

73, Chod, VP2ML

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CIRCLE 58 ON READER SERVICE CARD

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

New RF Safety Questions to Appear in New No-Code Exams

In adopting new radio frequency exposure guidelines this past year, the FCC required additional RF Safety questions to be immediately added to the Novice, Technician, and General Class Question Pools. To coincide with the VEC's review schedule, the ARRL requested that the Element 2 and 3A (Novice and Technician) RF Safety questions be delayed until July 1, 1997, with the required Element 3B (General Class) questions to be included as of July 1, 1998.

On December 1, 1996 the Question Pool Committee released revised questions for Element 2 and 3A, including RF Safety questions, which are to be included in examinations administered after July 1, 1997. On December 24, 1996 the FCC issued an order which goes along with the ARRL's motion to change the immediate RF Safety questions implementation date to July 1, 1997 and July 1, 1998 to coincide with the QPC's work schedule.

Not everyone is happy about the new RF Safety rules! We recently received a letter from John Abbott, K6YB, who authors the popular "Ride the Airwaves with Alpha and Zulu" amateur radio training material. His wife, Teri, is an elementary school teacher in the Los Angeles area. John, now retired, teaches an amateur radio class at Teri's school.

John writes, "I am very concerned about the future of ham radio, particularly the kids coming in at the No-Code Technician level. Those 80 Novice and 96 Technician radiation questions will frighten both kids and parents away from ham radio!"

"If ham radio is going to continue to be a part of the over 400 or more schools that I know of in the United States, including the one at which I teach ham radio, most of the RF Safety subelements are going to have to be eliminated. . . . This can be done by restricting the power levels permitted for Novice and Technician licensees, and FCC type accepting all equipment, both transceivers and antennas, available for use by Novice, Technician, or higher level licensees, who are willing to use the type-accepted [FCC approved] equipment, in order to be exempted from the radiation laws."

John believes that No-Code Technicians should be limited to no more than 50 watts PEP above 30 MHz with both Novice and Technician transceivers and antennas FCC type-accepted, with radiation exemption.

"The 1996 RF Safety questions could then be incorporated into Element 3B, the General class license examination, where full operating power levels are permitted. Passage of Element 3B, without a code examination, would grant full amateur privileges above 30 MHz, with complete responsibility for radiation control, if non-FCC type-accepted equipment is used."

John's letter arrived during late December. He sent it to me since (as a member of the VEC's Question Pool Committee) I am one of the three amateurs who drafted the new RF Safety questions. Copies of the letter were also sent to members of the amateur media and industry and to several FCC and ARRL officials as well.

Why The New RF Safety Questions?

On August 1st the FCC's Office of Engineering and Technology (OET) dropped a bombshell on the VEC's Question Pool Committee. It is the QPC's job to update and revise all of the questions used in Amateur Service license examinations. The Question Pool Committee consists of Ray Adams, W4CPA (Chairman); Fred Maia, W5YI, Vice Chairman; and members Bart Jahnke, W9JJ, and Scotty Neustadter, W4WW. Ray heads up WCARS-VEC, Fred oversees the W5YI-VEC, Bart supervises ARRL/VEC, and Scotty is with CAVEC.

What happened last August was that the FCC adopted new Maximum Permissible Exposure (MPE) standards to better protect the public and workers from exposure to potentially harmful RF fields. The FCC is required by the National Environmental Policy Act of 1969 (NEPA) to evaluate the effects of their actions on the quality of the human environment. Completion of the new guidelines was actually ordered by Congress as part of the massive Telecom Act signed into law by President Clinton on February 8, 1996.

OET actually had been working on new RF standards since April 8, 1993, when they issued a Notice of Proposed Rulemaking proposing to base their RF Safety regulations on the ANSI/IEEE C95.1-1992 standard instead of the 1982 ANSI guideline.

Now Congress was requiring the FCC to complete the new " . . . rules regarding the environmental effects of radio frequency emissions from FCC-regulated transmitters" within six months. It went right down to the wire and OET beat the deadline by less than a week.

The New RF Safety Standards

In 1985 the Commission adopted a 1982 ANSI standard for use in evaluating the effects of RF radiation on the environment. At that time all Amateur Service facilities were "categorically excluded" from RF exposure evaluation when the FCC concluded that they would not normally cause exposures in excess of the 1982 guidelines.

In 1992 ANSI adopted a new standard for RF exposure, designated ANSI/IEEE C95.1-1992, to replace its 1982 standard. The 1992 ANSI/IEEE standard is more restrictive in the amount of environmental RF exposure permitted and extends the frequency range under consideration to cover all frequencies from 3 kHz to 300 GHz—every frequency band used by amateur radio.

No one knew which version of the new RF exposure guidelines would be adopted, its impact on the Amateur Service, or its effective date. On August 1, 1996 we found out this information. Amateur radio transmitters were included for the first time. No longer would they be "categorically excluded."

The new guidelines provide for two levels of exposure limits. One "controlled" level applies to people who are aware of the potential for RF exposure. The other "uncontrolled" level covers those of the general public, who have no knowledge or control over their exposure.

Since amateur radio transmissions impact both the amateur operators who can exercise control over transmitted RF and their neighbors who cannot, amateur radio transmissions were ruled to be in both controlled and uncontrolled environments. The ARRL opposed use of the higher safety factor, but the FCC approved it anyway after determining that some amateur radio installations could indeed exceed the 1992 ANSI/IEEE standard.

Impact on License Exams

The FCC released its new "Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation" on August 1st, and surprisingly said the new rules would be effective at once! A transition period to January 1, 1997 was set when amateurs would have to comply with the new RF exposure standards, which means that amateurs would have to have taken steps on January 1, 1997 to ensure they were not exceeding the guidelines as of that date.

The new standards are based on a combination of the ANSI/IEEE and NCRP (National Council on Radiation Protection) guidelines which recommend two time-averaged exposure tiers. The NCRP MPE limits generally are more stringent than the ANSI/IEEE limits below 3 MHz and above 1500 MHz.

On August 6th the FCC's Wireless Telecommunications Bureau revised the Part 97 Rules with an immediate effective date to reflect the new RF exposure standard. The new Part 97 FCC requirements are:

a) An RF radiation evaluation is required when the transmitter power exceeds 50 watts peak envelope power (§97.13(c)).

b) Steps must be taken if the RF radiation is in excess of the limits to prevent such an occurrence (§97.13(c)).

c) A tenth new license examination topic entitled "Radio frequency environmental safety practices at an amateur station" was to be added to Element 2 (Novice), 3A (Technician), and 3B (General) written exams (§97.503(c)).

d) Element 2 would now have 35 questions with a pass rate of 26 questions answered cor-

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

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Question Topic	Novice 1993 El. 2	Novice 1997 El. 2	Technician 1993 El. 3A	Technician 1997 El. 3A
1. Commission Rules	105	123	50	64
2. Operating Procedures	35	38	41	45
3. Radio Propagation	12	18	33	39
4. Amateur Practices	44	50	53	54
5. Electrical Principles	44	53	22	27
6. Circuit Components	23	26	25	30
7. Practical Circuits	24	32	11	20
8. Signals/Emissions	22	27	22	24
9. Antennas/Feedlines	33	36	33	41
10. RF Safety	0	80	0	96
Total Questions	342	483	290	440
Increase over previous:		+41.2%		+52.1%
Total Novice/Tech	**1993: 632**		**1997: 923**	**+46%**

There are 46% more questions in the new combined Novice and Technician Class pools that will be implemented on examinations administered after July 1, 1997.

Table I– Topics and questions in the new Element 2 (Novice) and 3A (Technician) exams.

rectly; Element 3A and 3B each would consist of 30 questions (passing is 22 answered correctly).

e) Five RF Safety questions must be asked from each Element 2, 3A, and 3B question pool (§97.503(c)(10)).

ARRL Files Emergency Motion

On August 12th, the ARRL filed an "Emergency Motion for Extension of Effective Date of Rules" with the Federal Communications Commission. The League explained the question pool revision system to the FCC and pointed out that according to the new guidelines:

a) RF Safety questions had to be added to the question pools and used in examinations after August 7th, which was an impossibility since it would take considerable time to develop the questions.

b) The public does not expect new Element 2 and 3A questions until July 1997 and newly revised Element 3B questions until July 1998.

c) There would be a substantial cost to replace the examinations and software at hundreds of exam sites.

d) A reasonable time must be afforded to develop new question pools. "The vast majority of the individuals doing examination preparation and administration, at all levels, are volunteers. . . . In all fairness to these volunteers, a reasonable time must be afforded them to prepare for introduction of these new guidelines into the examination process. . . . This takes more than zero preparation time that the Commission has afforded, with absolutely no advance notice whatsoever."

e) The ARRL asked the FCC to extend implementation of the new Element 2 and 3A questions until July 1, 1997 and to extend Element 3B until July 1, 1998.

QPC Action

A new syllabus (outline) for Element 2 and 3A was developed in February 1996, and the QPC began actively working on revising the Novice and Technician questions in July. On August 1st the Question Pool Committee (QPC) was advised of the need for additional RF Safety questions to be included in not only Element 2 and 3A, but in Element 3B as well.

Since Part 97 had already been amended to include the new RF Safety requirement, the QPC had no alternative but to go ahead and develop a new syllabus for the RF Safety topic and Novice and Technician questions. The QPC's hope was that the FCC would go along with the League's request for an extension of the implementation date to July 1, 1997 on Element 2 and 3A and July 1, 1998 on Element 3B.

On December 1, 1996 the QPC released new Element 2 (Novice) and 3A (Technician)

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question pools. (Complete copies are available from the W5YI Group, P.O. Box 565101, Dallas, TX 75356 for $5 each postpaid.) See Table I for a breakdown of the topics and questions with a comparison to current (circa 1993) pools.

Due to the inclusion of 176 new RF Safety (and other) questions, the Novice and Technician pools are now substantially larger than previously was the case. There are 923 questions in the new combined Novice and Technician Class pools, 46% more than the 632 questions in the previous (1993) pools.

RF Safety Question Schedule

On Christmas Eve the FCC released an Order extending the transition compliance date; that is the date on which amateurs must ensure that they are not radiating more than the RF guidelines allow. This is what the FCC had to say:

"The Commission has amended its rules to extend the transition period for applicants and station licensees to determine compliance with the new requirements for evaluating the environmental effects of radio frequency (RF) electromagnetic fields from FCC-regulated transmitters.

"In 1985, the Commission adopted rules for evaluating the environmental effects of RF electromagnetic fields produced by FCC-regulated transmitters. In August 1996, the Commission amended those rules by provided for the use of new guidelines and methods, and established a transition period, until January 1, 1997, for applicants and stations to come into compliance with the new requirements."

Several parties' (including the American Radio Relay League) petitions asked the Commission to extend the transition period beyond January 1, 1997, arguing that the existing transition period failed to provide adequate time for affected parties to achieve compliance with the new rules.

The Commission stated that " . . . based on the petitions and comments, it is clear that most station applicants will need additional time to determine that they comply with the new requirements." The FCC said that a delay in the compliance date would also " . . . permit applicants to review a revised [RF Safety] information bulletin and to make the necessary measurements or calculations to determine that they are in compliance."

The Commission indicated it did not believe that granting any extension of the transition period would have significant adverse effects on public health. Therefore, the Commission extended the transition period to September 1, 1997 for most radio services.

For the Amateur Radio Service, however, the transition period was extended to January 1, 1998. Additionally, the Commission will allow the question changes to amateur radio operator license examinations to be made as the examinations are routinely revised between now and July 1, 1998.

The Commission believes that these extensions are necessary so that applicants and licensees will have adequate time to understand the new requirements and to ensure that their facilities are in compliance with them.

How Are The Amateur License Exams Affected?

The FCC has now agreed to go along with the ARRL's request that the RF Safety questions for Element 2 and 3A be made effective July 1, 1997 and the Element 3B questions be added on July 1, 1998. The new RF Safety examination questions that the QPC has developed will show up in Novice and Technician examinations administered after July 1, 1997.

Part 97 will again have to be amended by the Wireless Telecommunications Bureau since (at this writing) Section §97.503(b)(3) still requires immediate implementation of all RF Safety questions, including those in Element 3B. The Question Pool Committee is already working on a revised syllabus (outline) for Element 3(B).

Effective July 1, 1997, Element 2 and 3(A) will have five more questions (increased from 30 to 35). Element 3(B) will not be increased from 25 to 30 questions until July 1, 1998.

As mentioned above, amateurs will not have to complete the required RF radiation evaluation until January 1, 1998.

The New RF Safety Questions

The new RF Safety questions (all exam ques-

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CIRCLE 87 ON READER SERVICE CARD

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Both programs support Epson-compatible dot-matrix, and HP-compatible laser and ink jet printers.
Prices - U.S. & Canada - EZNEC $89, ELNEC $49, postpaid. Other countries, add $3. VISA AND MASTERCARD ACCEPTED.
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P.O. Box 6658 fax **503-671-9046**
Beaverton, OR 97007 email **w7el@teleport.com**
CIRCLE 61 ON READER SERVICE CARD

tions, for that matter) are intended to provide a curriculum for amateur radio license training classes or self-training. The new rules apply to all amateurs. We are told that the FCC's Office of Engineering and Technology is now working on a new RF Safety booklet specifically directed at radio amateur operations. This booklet could supplement Part 97 rules and be used by amateurs to certify compliance with the RF exposure safety guidelines.

Most amateur operators do not possess the needed measurement equipment, technical skills, and/or financial resources to properly conduct an RF radiation evaluation. Therefore, the FCC is permitting the evaluation to be conducted based on computer modeling of a worst-case scenario. This involves using a computer program or a tabular chart to determine how far an amateur station with certain specified operating characteristics should be from the controlled or uncontrolled environment.

Effective January 1, 1998 applicants for new licenses and renewals also will be required to certify on a new version of the FCC Form 610 application that they have read and understand the FCC's rules regarding RF exposure.

The RF Safety topic is not completely new to the Question Pool Committee. We have always had questions on this subject in our pools. What is new are the new guidelines and compliance requirement. New Part §97.13(c) requires that an RF evaluation be conducted when more than 50 watts is radiated. This is easy to say, but there are many variables to take into consideration when completing the compliance evaluation. Among these factors are power levels, emission types, wavelength (the radiated frequency), type and gain of the antenna, height above ground, antenna patterns, and so forth. Furthermore, there are two types of exposure levels applying to controlled and uncontrolled environments. And there are different time averaging (duty cycle) constraints that apply to each.

There are three ways to determine RF exposure. They are by:

1) Using electronic instruments that measure field strength;

2) Performing complex mathematical calculations based on generic formulas provided by the FCC; and by

3) Using tabular charts and computer programs which determine "worst case" estimated distances to meet the RF power density guidelines.

It is this third method that the Question Pool Committee has used in its RF Safety questions, since it is the easiest for individuals to understand and use. Several individuals have raised the point that the Element 2 and 3A questions are now too difficult for youngsters to comprehend. That may be so, but the Question Pool Committee had no alternative but to cover the required material, since both Novice and Technician operators are authorized to use transmitter power levels that fall under the new RF exposure guidelines and the law (Part 97) requires it.

John Abbott, K6YB, feels that amateur transmitter power could be statutorily limited for certain amateurs who would agree to use low-power type-accepted equipment. He contends this would eliminate the need for difficult RF Safety questions. While this may be true, the fact remains that right now, however, no such arrangement exists in the Amateur Service.

73, Fred, W5YI

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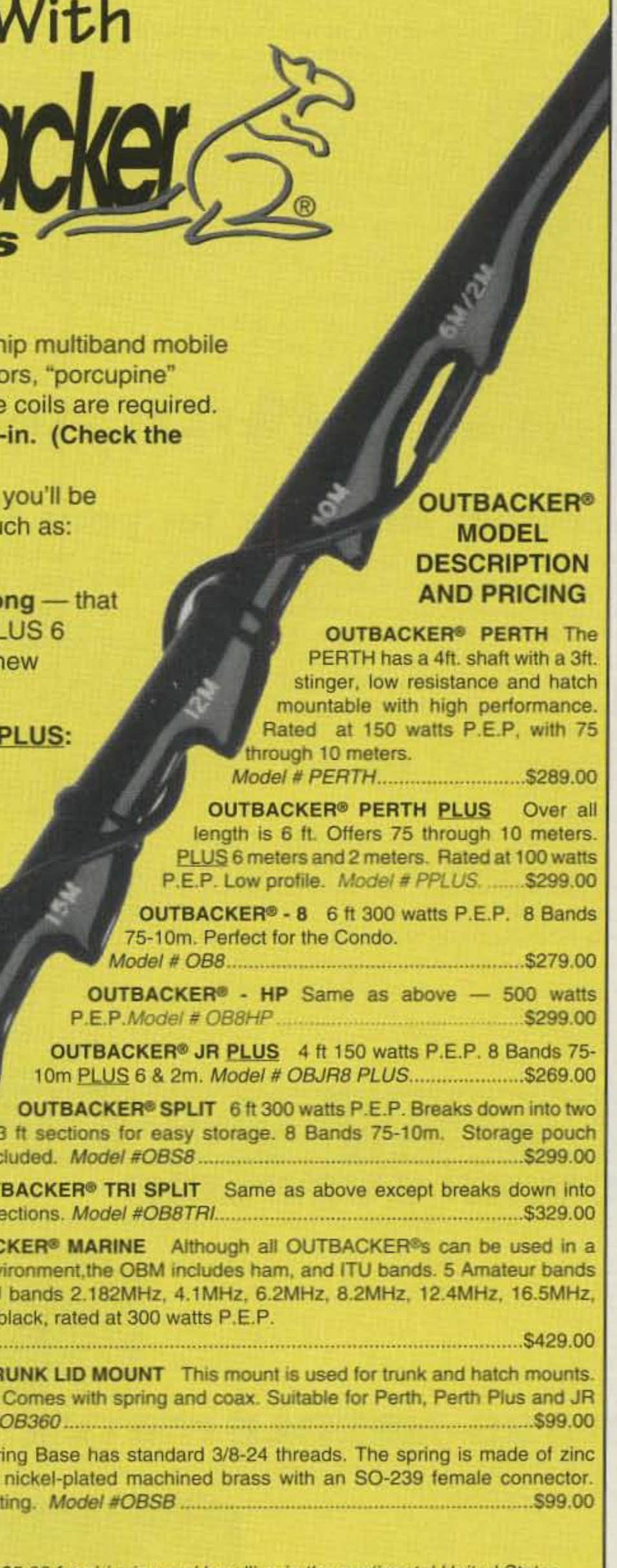

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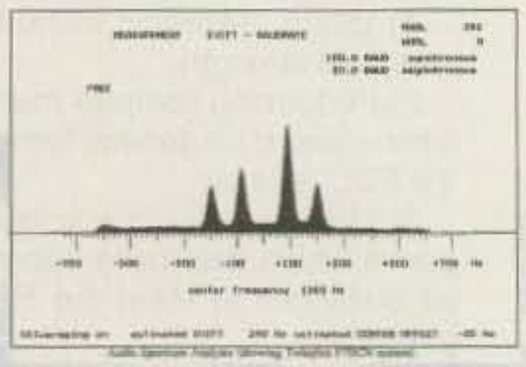

Code 3 Gold makes decoding easy for the novice and expert. Unlike the CW/RTTY decoders, Code 3 is an exclusive auto classification that tells you what you are listening to (30 + modes) and automatically sets you up to start decoding. Automatic analysis and oscilloscope functions are both selectable from almost anywhere in the program. The six Main Menu screens make moving around the Code 3 Gold program a snap. Code 3 is the most sophisticated and encompassing decoder available. The 26 standard modes include:

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- FEC-S • FEC1000 Simplex • Sitor CCIR 625/476-4 • SWED-ARQ-ARQ-SWE
- Sports info 300 baud • ARQ - Navtex • ARQ-E/ARQ1000 Duplex • AX25 Packet
- ARQ-N-ARQ1000 • Hellscreiber-Synch/Asynch • Facsimile all RPM (up to Duplex Variant)
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- ARQ-E3-CCIR519 but without Synch.768 pixels Variant • ARQ6-70 • Autospec - Mk's I and II
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Available options:

Option 3 Piccolo	Option 4 Coquelet	Option 5 4 special	Option 8
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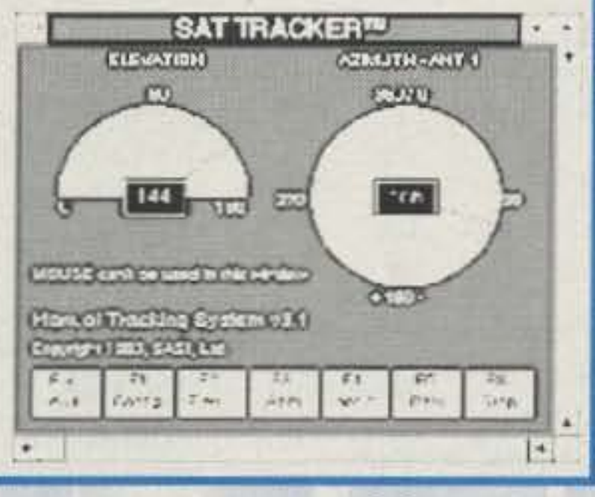
Requirements: MSDOS compatible 286 with an unused parallel interface.



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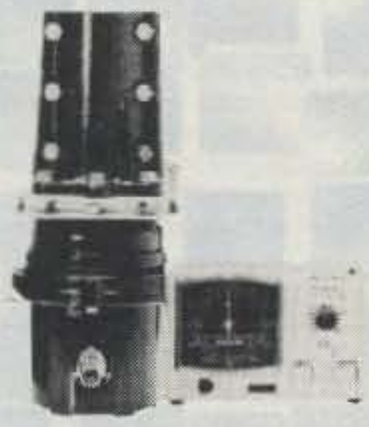

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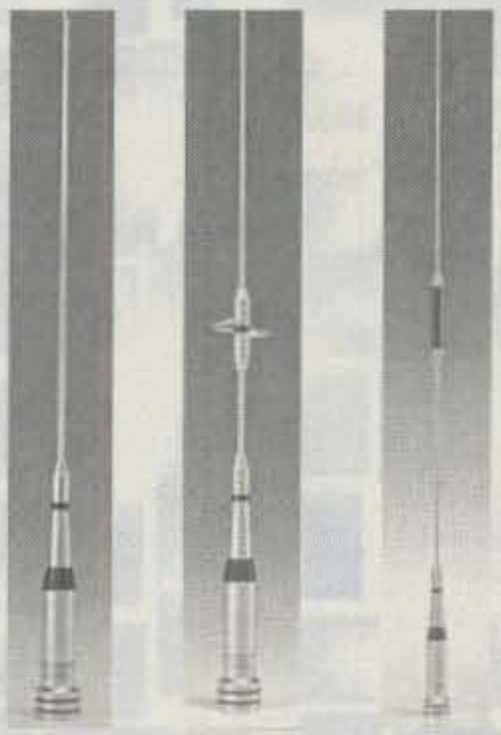

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HP2070H: VHF 1/2 wave/UHF 3/5 wave, 0 dBd VHF/ 3.8 dBd UHF, GOLD/TEFLON UHF conn., 18.5 inch. long

HP2000C: VHF 3/4 wave, 4dBd - 6.15 dBi., 143 - 149MHz, GOLD/TEFLON UHF conn., 60 inch. long

HP2000: VHF 1 x 5/8 wave, 3.2 dBd - 5.35dBi, 143 - 149MHz, GOLD/TEFLON UHF conn., 48.5 inch. long

HP7000C: UHF 2X5/8 wave, 6 dBd - 8.15 dBi, 440 - 450MHz, GOLD/TEFLON UHF conn., 34.6 inch. long

HP7000: UHF 1 X 5/8 wave, 3.2dBd - 5.35dBi, 440-450MHz, GOLD/TEFLON UHF conn., 18.5 inch. long

CIRCLE 171 ON READER SERVICE CARD

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BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Cycle 23—Great Years Ahead

A recent meeting of solar experts concluded that Cycle 23, the new sunspot cycle, will be an exceptionally high cycle. In all probability it is expected to exceed the peak of 159 recorded during Cycle 22, which was the third highest in recorded history. The mother of all sunspot cycles was Cycle 19, which peaked witha record-breaking level of 201 in November 1957.

The NOAA Space Environment Center (SEC), with the support of the NASA Office of Space Science, recruited a blue-ribbon scientific panel to assess prediction techniques and arrive at a reasoned consensus, including uncertainty, on how sunspot Cycle 23 will develop. The panel, consisting of 12 scientists from the US, Australia, Germany, and the UK, convened from September 9–25, 1996 in Boulder, Colorado. Opinions from a dozen other scientists not in attendance were also submitted to and considered by the panel. The panel reviewed six different groupings of sunspot prediction methods. In arriving at a consensus, they noted that the dramatic variability possible from one cycle to the next shows the difficulty in making empirical predictions. Arriving at a consensus was further complicated, they reported, by the lack of a successful quantitative, theoretical model of the sunspot cycle.

The panel predicts, assuming a rise time of 3.4 years, that Cycle 23 should peak during March 2000 with a median sunspot count of 160, ±30. The cycle is expected to end by 2007. The scientists assumed the beginning of Cycle 23 to be September 1996. Observation between now and the end of 1997 will allow more precise timing of the start of Cycle 23, and dates may have to be adjusted accordingly. The panel expects to review the progress of Cycle 23 as it progresses, and will update it with new information as it becomes available.

The panel's consensus forecast for Cycle 23 is shown graphically in fig. 1 for both expected sunspot counts and 10.7 cm solar flux levels. Their expectations for a high sunspot cycle herald exceptionally good HF propagation conditions for more of the remainder of this century and into the early years of the 21st century. So be sure to get antennas back in shape, or install new ones, fine-tune rigs, and be prepared for what may well be near record conditions on the HF bands in the coming years.

The panel's complete report, most of it in scientific jargon, is available from the Web at the following URL address: <http://www.sel.noaa.gov/>. Look for the link "SEC Publication: *Solar Cycle Project* Summary of Panel Findings" on the Home Page.

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a monthly mean sunspot level of 18.6 for November 1996. This was the highest monthly mean reported in over a year. It results in a 12-month running smoothed sunspot number of 8 centered on May 1996. This is a decline from the previous month's level. During November daily levels of solar activity varied between a high of 57 on the 25th (right in the middle of the CQ World-Wide DX CW Contest weekend, as we reported last month) to an absolutely spotless sun from November 1st through the 8th and on the 14th. According to daily observations made at Penticton, British Columbia by the Dominion Radio Astrophysical Observatory of Canada, the adjusted mean level of 10.7 cm solar flux for November 1996 was 77. This results in a 12-month running number of 72 centered on May 1996. A smoothed sunspot number on the order of 12 and a 10.7 cm solar flux level of approximately 73 is forecast for March 1997, as Cycle 23 slowly rises.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 1997

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 5, 10-11, 17-18, 25	**A**	**A**	**B**	**C**
High Normal: 9, 13, 16, 19, 23-24, 26	**A**	**B**	**C**	**C-D**
Low Normal: 3-4, 8, 12, 14-15, 20-22, 30-31	**B**	**C**	**D**	**D-E**
Below Normal: 2, 6-7, 27, 29	**C**	**C-D**	**D-E**	**E**
Disturbed: 1, 28	**C-D**	**D**	**E**	**E**

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be poor (D) on March 1st, fair-to-poor (C-D) on the 2nd, fair (C) on the 3rd and 4th, excellent (A) on the 5th, etc.

46th Anniversary

This month's column marks the beginning of my 47th year as Propagation Editor for *CQ*. I have written this column each month without an interruption through most of sunspot Cycle 18, through the record-breaking Cycle 19, and through Cycles 20, 21, and 22! Now we are in the beginning of Cycle 23, and I hope that this column will continue to serve as a source of useful and reliable HF propagation information throughout its life.

I already hold the honor of being the Dean of the *CQ* staff. The other night, a friend of mine told me that I should now probably be in the *Guinness Book of Records* for continuously

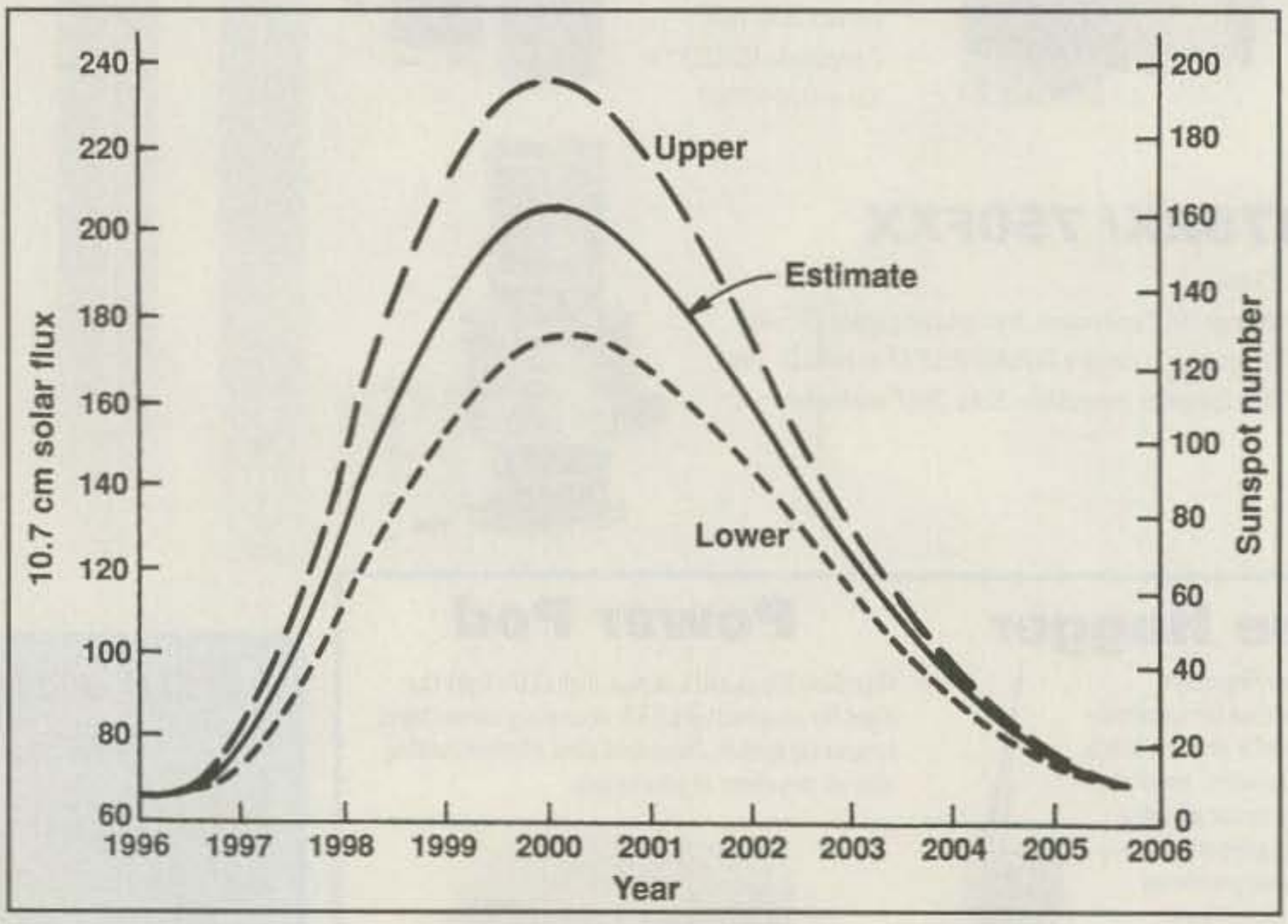

Fig. 1– Blue-ribbon panel of solar scientists consensus prediction for sunspot Cycle 23. It is expected to be of near record intensity, and accompanied by great HF propagation conditions. (Original graph by SEC/NOAA)

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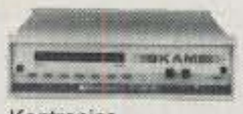

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Say You Saw It In CQ

editing the same column for 46 years! The biggest reward to me, however, still remains the mail that I receive from readers of this column. It is the fuel that fires me to turn out this column each and every month from wherever I might be in the world!

March Conditions

In the 46 years that I have been writing this column, one of the questions I have been asked most is "What season of the year is best for DX propagation on the HF bands?"

This isn't an easy question to answer, since there are so many variables involved, and the answer can be different for different sets of conditions and for the various bands. In a general way, however, taking into account the overall number of hours each band between 10 and 160 meters can be expected to open for DX, and the number of different areas to which the bands may open, I believe that the spring and fall months are optimum for DX propagation.

There is a solar-ionospheric relationship to explain this. Spring and fall are called the *equinoctial* seasons. These are the times when the sun is most nearly overhead at the equator, making night and day of almost equal length in all parts of the world. On March 21st and September 22nd, the sun is directly over the equator, and the length of night and day is exactly equal.

The vernal, or spring, equinoctial period in the northern hemisphere has a noticeable influence on HF propagation conditions for a period of several weeks lasting from late February through late April. The effects of theautumnal, or fall, equinoctial period are felt from early September through late October.

During equinoctial periods it is always spring in one hemisphere and fall in the others. This tends to create an ionosphere of more similar characteristics throughout the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. It is this "ionospheric equalization" which takes place during the equinoctial periods that is responsible for optimum DX conditions.

An improvement in DX propagation conditions is usually most noticeable on the long circuits between the northern and southern hemispheres—for example, from the US to Australia, South America, southern Africa, southern Asia, Antarctica, etc. Look for these openings during this coming month on the HF bands.

The best times for these openings are shortly before local sunrise and again shortly after local sunset on the 160, 80, 40, and 30 meter bands, and for an hour or two after sunrise and again for an hour or two before sunset on 17 and 20 meters. On 15, 12, and 10 meters check for inter-hemispheric openings towards the southeast and south from a few hours before noon through the early afternoon hours. Check later in the afternoon for openings towards the south and southwest and towards the west.

Twenty meters is expected to be the best band for DX propagtion from sunrise to sunset during March, followed by 15 and 17 meters. A few 10 meter openings are also forecast for March, mainly to southern and tropical areas during the daylight hours.

During the period between sunset and sunrise 30 and 40 meters are expected to be the optimum bands for DX propagation, with good openings forecast to many areas of the world.

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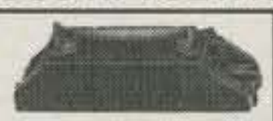

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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. In the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

Short-Skip Propagation Chart
March & April 1997
Local Standard Time
At Path Midpoint

Band (Meters)	Distance Between Stations (Miles) 50-250	250-750	750-1300	1300-2300
10	Nil	Nil	08-19(0-1)	08-13(1-0) 13-16(1) 16-19(1-0)
15	Nil	08-16(0-1)	09-12(1) 12-17(1-2) 17-18(0-1)	08-09(0-1) 09-10(1) 10-13(1-2) 13-14(2) 14-17(2-3) 17-18(1-2) 18-20(0-1)
20	Nil	07-08(0-1) 08-09(0-2) 09-14(0-3) 14-16(0-2) 16-23(0-1)	07-08(1) 08-09(2) 09-10(3) 10-14(3-4) 14-16(2-4) 16-18(1-4) 18-19(1-3) 19-20(1-2) 20-23(1) 23-05(0-1)	06-07(0-1) 07-08(1-2) 08-09(2-3) 09-10(3) 10-15(4-3) 15-18(4) 18-19(3) 19-20(2-3) 20-21(1-2) 21-05(1) 05-06(0-2)
40	07-09(0-1) 09-10(0-2) 10-12(2-3) 12-17(3-4) 17-19(2-3) 19-20(1-2)	06-07(0-2) 07-09(1-4) 09-10(2-4) 10-15(4-3) 15-17(4) 17-19(3-4)	06-07(1) 07-08(4-2) 08-15(3-1) 15-17(4-2) 17-19(4-3) 19-20(4)	06-08(2-1) 08-15(1-0) 15-16(2-0) 16-17(2-1) 17-19(3-2) 19-21(4-3)
40	20-22(0-1)	19-20(2-4)	20-22(2-4)	21-22(4)

		20-22(1-2) 22-00(0-2) 00-06(0-1)	22-00(2-3) 00-06(1-2)	22-00(3-4) 00-02(2-3) 02-06(2)
80	07-08(2-3) 08-11(3-4) 11-18(4) 18-20(3-4) 20-22(2-3) 22-00(1-2) 00-06(1) 06-07(1-2)	07-08(3-2) 08-11(4-1) 11-16(4-0) 16-18(4-2) 18-20(4-3) 20-22(3-4) 22-00(2-4) 00-06(1-2) 06-07(2)	07-08(2-1) 08-11(1-0) 11-16(0) 16-18(2-1) 18-20(3-2) 20-00(4) 00-05(2-3) 05-07(2)	07-08(1-0) 08-16(0) 16-18(1-0) 18-20(2-1) 20-22(4-2) 22-00(4-3) 00-05(3) 05-07(2-1)
160	05-07(4-2) 07-09(3-1) 09-17(2-0) 17-19(3-1) 19-20(4-2) 20-05(4)	05-06(2-1) 06-07(2-0) 07-09(1-0) 09-17(0) 17-19(1-0) 19-20(2) 20-22(4-3) 22-03(4) 03-05(4-3)	05-06(1) 06-19(0) 19-20(2-1) 20-22(3-2) 22-03(4-3) 03-05(3-2)	05-06(0-1) 06-19(0) 19-20(1-0) 20-22(2) 22-03(3-2) 03-05(2-1)

ALASKA
Openings Given in GMT

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	Nil	22-00(1)	22-00(1) 00-02(2) 02-04(1)	06-13(1) 07-12(1)*
Central USA	Nil	20-22(1) 22-00(2) 00-01(1)	22-00(1) 00-03(2) 03-05(1)	07-09(1) 09-12(2) 12-14(1) 07-12(1)*
Western USA	Nil	20-22(1) 22-00(2) 00-03(1)	19-22(1) 22-00(2) 00-02(3) 02-04(2) 04-06(1)	06-08(1) 08-09(2) 09-12(3) 12-13(2) 13-15(1) 08-10(1)* 10-12(2)* 12-14(1)*

HAWAII
Openings Given in Hawaiian Standard Time

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Eastern USA	Nil	08-11(1) 11-13(2) 13-14(3) 14-15(2) 15-16(1)	02-05(1) 05-07(2) 07-13(1) 13-15(2) 15-17(3) 17-19(2) 19-21(1)	18-19(1) 19-21(2) 21-00(3) 00-02(2) 02-03(1) 19-21(1)* 21-00(2)* 00-02(1)*
Central USA	11-15 (1)	08-09(1) 09-13(2) 13-15(3) 15-16(2) 16-17(1)	03-05(1) 05-08(2) 08-13(1) 13-15(2) 15-16(3) 16-18(4) 18-19(3) 19-21(2) 21-23(1)	18-19(1) 19-21(2) 21-01(3) 01-04(2) 04-05(1) 19-21(1)* 21-01(3)* 01-01(2)* 02-03(1)*
Western USA	11-15(1)	08-09(1) 09-10(2) 10-12(3) 12-15(4) 15-16(3) 16-17(2) 17-18(1)	02-04(1) 04-06(2) 06-09(4) 09-11(3) 11-13(2) 13-15(3) 15-17(4) 17-19(3) 19-21(2) 21-23(1)	17-19(1) 19-20(2) 20-23(4) 23-05(3) 05-06(2) 06-07(1) 19-20(1)* 20-21(2)* 21-04(3)* 04-05(2)* 05-06(1)*

**Indicates best time to listen for 80 meter openings.*
Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances use the preceding Short-Skip Chart.
#See explanation in "How To Use Short-Skip Charts" in this column.

Some fairly good DX openings are also predicted for 80 meters during the hours of darkness, and some 160 meter DX openings may also be possible during this period. When propagation conditions are High Normal or better, the 20 meter band may remain open to some areas of the world during the hours of darkness.

For specific times of DX openings for each amateur band 10 through 160 meters during March, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for March and April, as well as charts centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for distances between approximately 50 and 2300 miles.

For day-to-day changes in HF propagation conditions expected during March, see the Last-Minute Forecast, which appears at the beginning of this column.

VHF Ionosphere Openings

Chances look a little better for ionospheric openings on the VHF bands during March. A seasonal increase is expected in short-skip sporadic-*E* type openings on 10 meters, and an occasional opening may also be possible on 6 meters. These openings are more likely to occur during the daylight hours over distances of approximately 1000 to 1400 miles.

There is also a good chance for some widespread auroral activity on the VHF bands, especially when the HF bands are Below Normal or Disturbed. Check the Last-Minute Forecast at the beginning of this column for those days likely to be in these categories during March.

Not much meteor activity is expected this month, but some might be possible during minor showers that may occur March 14–15 and March 24–25.

73, George, W3ASK

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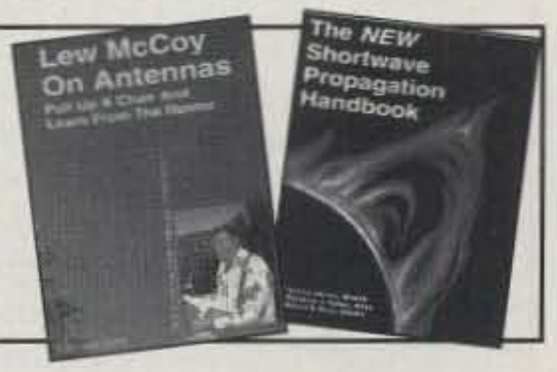

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MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

BY IRWIN MATH, WA2NDM

A Primer on Optical Communications—Part III

Last month we completed construction of an optical transmitter. Now it's time to investigate optical receiving techniques and to build a couple of companion receivers.

Unlike their RF counterparts, optical receivers do not use a separate amplifier stage in the "front end." Although optical amplifiers do exist, they are rather exotic and expensive using today's technology. Normally, incoming light is channeled directly to a light-sensitive detector. These detectors come in various forms, ranging from simple silicon photo-diodes to complex light-sensitive ICs. For our initial experiments, we will employ an inexpensive silicon photo-transistor as the front-end. Suitable devices include the HEP-312 or RadioShack 276-145. These devices are fairly sensitive, easy to obtain, and while not the ultimate, will enable us to get started with little effort and cost. Later we will look at a better choice for a front-end.

Fig. 1 is a schematic of a very simple optical receiver. The light-sensing photo-transistor is connected in a common emitter circuit, much like that of a conventional amplifier, but without any base-bias or electrical input signal connection. With no incoming light the transistor is, as one would expect, essentially cut off. As soon as light starts to fall on the light-sensitive portion of the device, however, it begins to conduct, causing the collector current to begin to rise. This produces a voltage drop across the collector load resistor, the magnitude of which is directly related to the intensity of the incoming light. As a result, any variation (including amplitude modulation) of the incoming light is directly converted into a voltage that matches the variation. Since the actual current in the stage is quite small, a fairly large value collector resistor is used to develop a reasonable voltage level. The voltage output of the photo-transistor stage is then AC coupled to the next stage, a non-inverting operational amplifier which boosts the small voltage by an adjustable gain of from 10 to 200. You will notice that high-value bias resistors are used in the op-amp input circuit to avoid loading the photo-transistor collector resistor. This is also why a JFET op-amp (such as the TL082) is used for the gain stage. Finally, an emitter follower stage and a low-cost audio output transformer (RadioShack 273-1380 or equivalent) is used to provide the proper match to enable the output of the op-amp to properly drive a pair of 8 ohm low-impedance headphones or a small PM speaker.

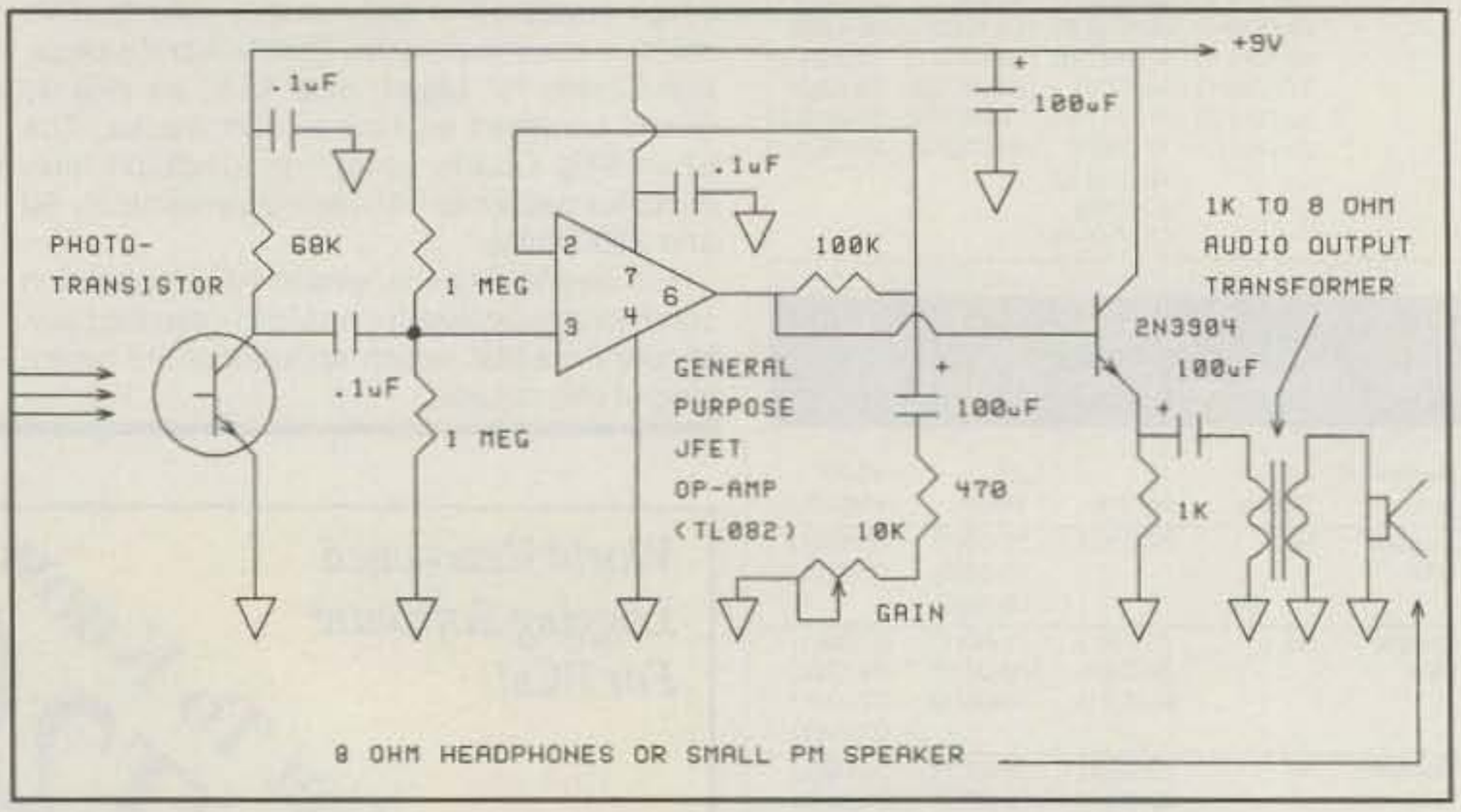

Fig. 1– Simple phototransistor optical receiver. Connect the 0.1 µF op-amp bypass across the op-amp pins.

Construction of this circuit is not overly critical. You can safely build the receiver on perfboard or even on a plug-in breadboard if so desired. Be sure to make all connections carefully and double-check your work. Also try to keep the connections to and from the photo-transistor as short as possible, since the following op-amp stage can be set for fairly high gain and you do not want extraneous pickup or self-oscillation to occur.

After construction is completed, apply power, connect the headphones or speaker (set the gain pot half way) and "smoke test" the unit by pointing the photo-transistor toward a nearby fluorescent lamp. An AC buzz, caused by the circuit responding to the on-off flickering of the fluorescent lamp, indicates that everything is working properly. You can now use the receiver to detect the output from the transmitter built last month by pointing the photo-transistor toward the light-producing LED of the transmitter. You should hear clearly any audio signal applied to the transmitter. Small paper tubes fitted over the transmitting LED and receiving photo-transistor as shown in fig. 2 will help direct the light path somewhat and eliminate the effects of stray light from affecting the receiver.

It is interesting to note that such a receiver is analogous to the early crystal set in that it detects a wide range of frequencies (wavelengths) at the same time. The only "tuning" element, as such, is the opti-

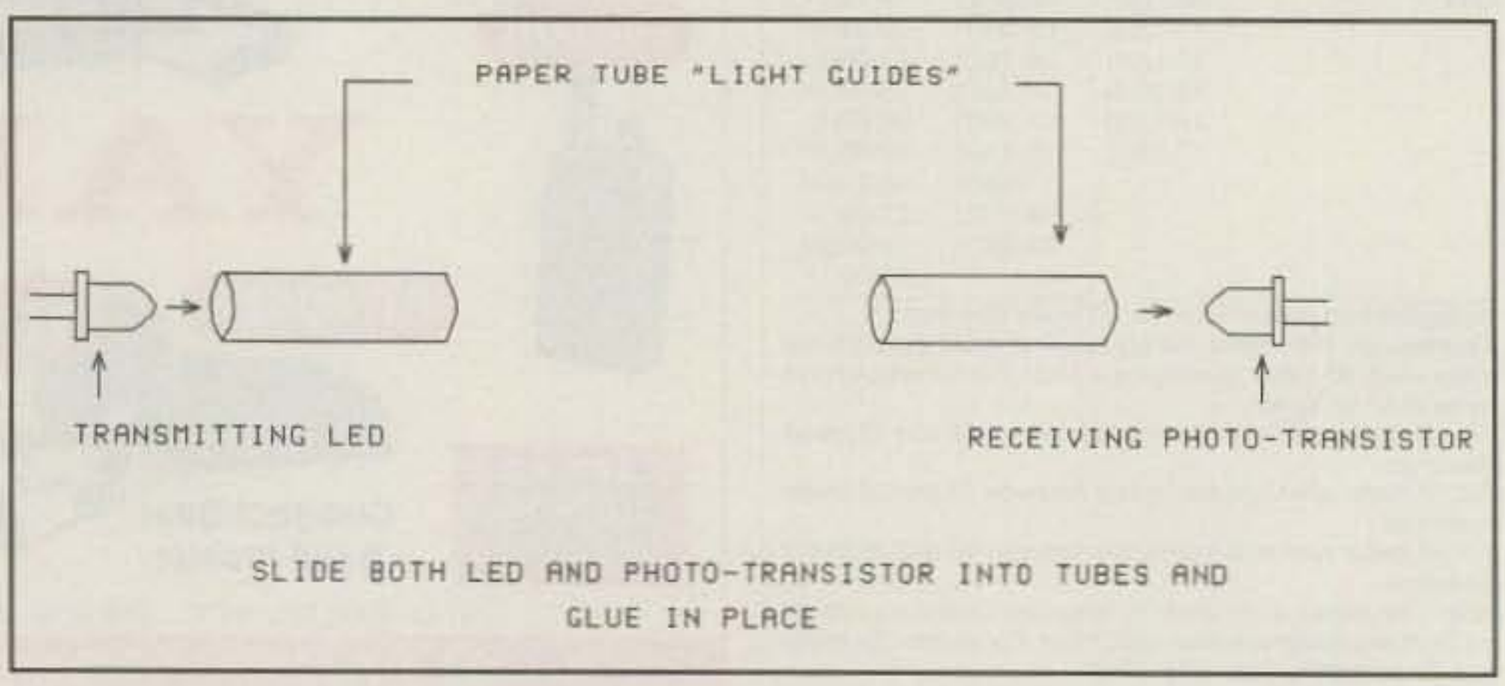

Fig. 2– Method of fabricating a simple light guide.

c/o CQ magazine

Say You Saw It In CQ

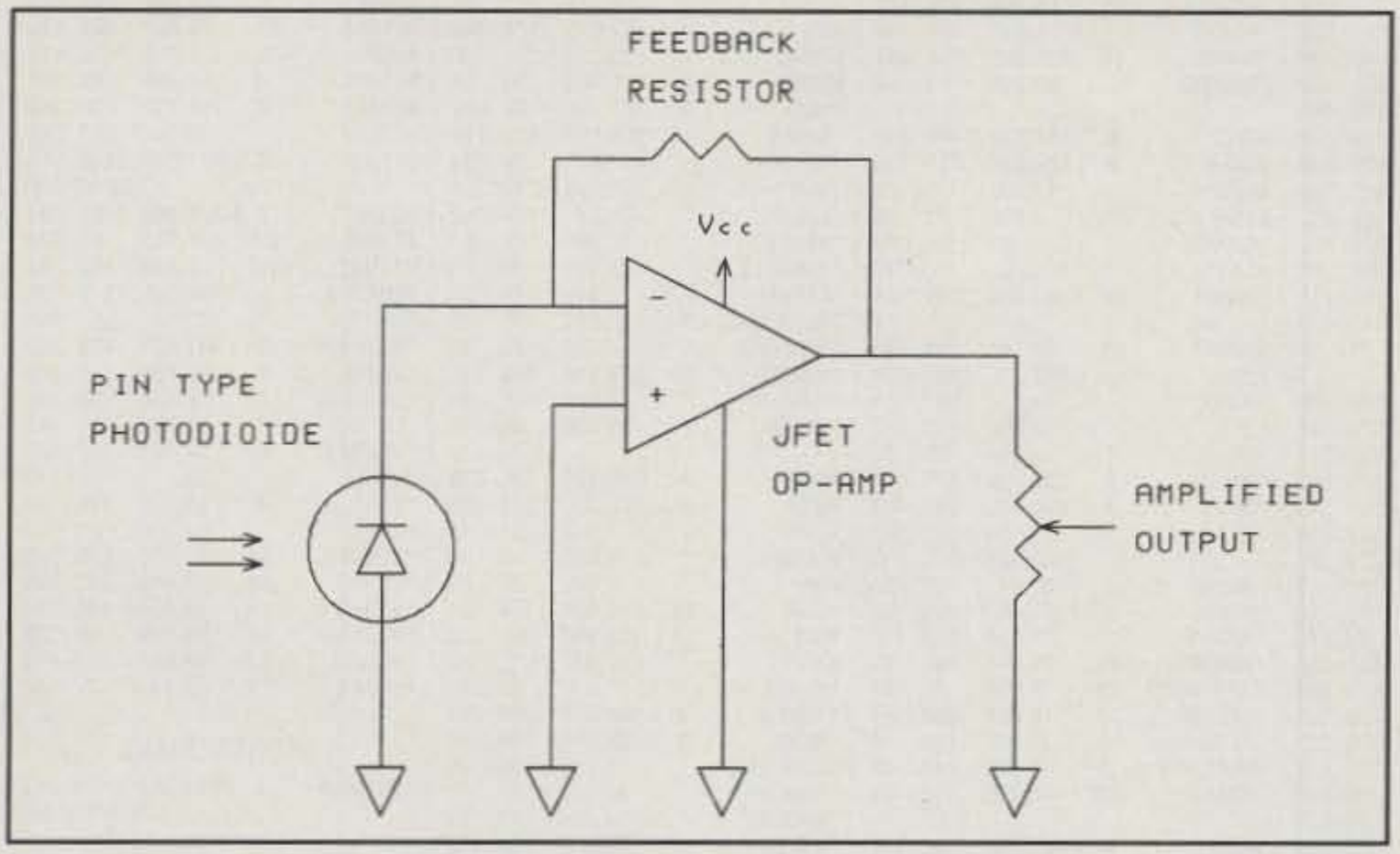

Fig. 3– Circuit for "professional" front-end.

cal coating on the photo-transistor package (if it is even provided with one). This coating acts as a filter the peak response of which lies in the IR (infra-red) portion of the spectrum which "roughly" matches the output wavelength of the transmitting LED. True narrow bandwidth sensitivity, at least as far as optical wavelengths or frequencies are concerned, is expensive and hard to achieve for the amateur.

A significant improvement on the photo-transistor front-end can be obtained by using a silicon PIN-type photodiode such as the Panasonic PN334PA (Digi-Key PN334PA-ND), the NEC PH310 (Mouser 551-PH310) or the equivalent. The PIN photodiode has a much lower noise figure than the photo-transistor (not to mention much higher speed) and is what is almost always used as the detector in so-called "professional" optical transmission systems.

Fig. 3 is the schematic of the front-end to use with this device. This type of circuit is called a current-to-voltage converter. As you will note, the photodiode is connected directly to the inverting input of an op-amp. Since the input to any op-amp is a virtual zero impedance, only current can flow from the photodiode. The small current flowing into the op-amp causes the output to generate a voltage large enough to produce an equivalent current in the feedback resistor. According to Ohm's Law, the magnitude of this voltage is equal to the input current multiplied by the value of the feedback resistor ($V_{out} = I_{in} \times R_f$). As a result, with a 100K feedback resistor the small photodiode current will be amplified 100 thousand times. For audio use this resistor can be increased further (to several hundred Kohms) for even more gain.

Fig. 4 shows a complete "professional" optical receiver which consists of the front end, an intermediate gain-stage, and an output stage suitable for driving 8 ohm headphones or a small speaker. Depending on the setting of the gain of the front end, the receiver of fig. 4 is capable of detecting fairly low light levels. You can temporarily use the paper light guiding tubes of fig. 2 for testing purposes with last month's transmitter. You can even change the LED in last month's transmitter to one with higher output, such as the RadioShack 276-143 (which, by the way, produces a peak power output of 16 milliwatts of invisible infra-red light at a maximum current of 100 ma). However, for longer distance operation, the use of an "optical antenna" is a must.

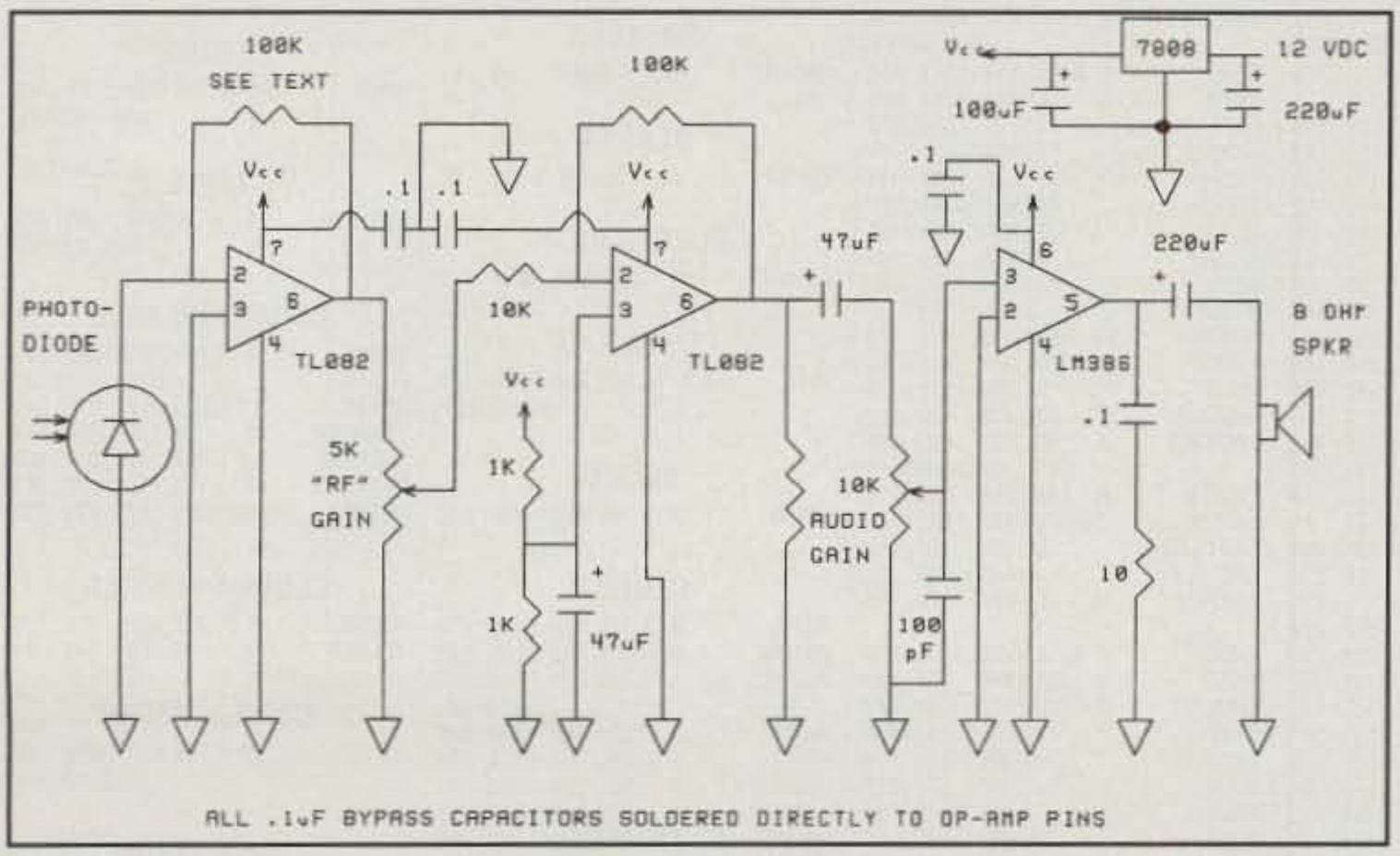

Fig. 4– Complete "professional" optical receiver.

Next month we will look at suitable optical antennas for this project and how to convert everything into a true optical communications system. In the meantime, you may wish to "point" your optical receivers toward various sources of modulated light, such as the remote control unit for your TV set or even the screen of the set itself. The signals you hear will undoubtedly be quite interesting.

For reference purposes Digi-Key can be reached at 1-800-344-4539 and Mouser can be reached at 1-800-346-6873.

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(Continued from page 18)

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

SSB RESULTS
QRP/p SECTION
WORLDWIDE

LY3BA	**A**	**605,581**	**764**	**443**
RW9AB	**A**	**559,112**	**597**	**376**
YU1KN	**A**	**536,469**	**613**	**471**
YU1EA	*	514,512	678	397
SP3SLA	**A**	**476,560**	**639**	**368**
SP7LZD	*	418,992	565	344
N1AFC	**A**	**364,192**	**410**	**304**
YT7TY	*	314,484	527	292
7J6ACT	**A**	**301,301**	**534**	**301**
WT3W	**A**	**218,316**	**372**	**276**
UAØSE	**A**	**211,905**	**388**	**255**
RU4SS	**A**	**174,930**	**400**	**343**
YU1LM	*	173,665	418	235
AA7VY	**A**	**164,651**	**335**	**229**
KA1CZF	*	135,044	251	196
UX8I	**A**	**95,680**	**280**	**208**
KV8S	**A**	**77,121**	**200**	**171**
VE7CQK	**A**	**75,504**	**200**	**143**
UT8IA	*	70,308	250	189
OH5NHI	**A**	**58,645**	**228**	**185**
RU3RR	*	55,315	227	185
N8AXA	*	44,735	115	114
ON7CC	**A**	**42,673**	**173**	**139**
N7JXS	*	29,380	147	113
WB3ECU	A	27,499	125	107
DK4NQ	**A**	**26,862**	**154**	**111**
YO2CJX	**A**	**15,680**	**112**	**70**
IKØXBX	**A**	**14,620**	**90**	**86**
KS4KP	**A**	**13,552**	**103**	**88**
VE6GK	**A**	**13,542**	**82**	**74**
OK1UHZ	**A**	**10,640**	**878**	**76**
JH3AKD	*	9,570	73	66
WD9IAB	**A**	**4,950**	**65**	**55**
JL6IPK	*	2,898	44	42
WB6ITM	**A**	**2,652**	**43**	**39**
JE7DOT	*	2,277	35	33
DL2JRM	**A**	**1,728**	**33**	**32**
N8ET	*	1,495	24	23
ZW2WAL	**28**	**66,232**	**225**	**136**
LU7VCH	**28**	**45,714**	**167**	**114**
LU7FEU	*	22,680	125	84
JA6UBK	**28**	**2,432**	**46**	**38**
JF3EIU	*	1,404	30	27
LZ1KVZ	**28**	**680**	**21**	**17**
JH1HRJ	**21**	**33,288**	**135**	**114**
S59D	**21**	**26,319**	**108**	**93**
SVØAN	**21**	**9,048**	**58**	**52**
EC1AIS	**21**	**3,440**	**54**	**43**
WA6FGV	**21**	**2,806**	**67**	**61**
OH2MPO	**21**	**190**	**10**	**10**
YU1NR	**14**	**483,408**	**617**	**432**
IØFHL	**14**	**286,275**	**356**	**275**
EA7AIG	**14**	**91,520**	**305**	**220**
W6CN	**14**	**72,890**	**228**	**197**
YU1GN	*	58,764	221	166
KC6ETY	*	48,565	143	123
W4DEC	**14**	**46,294**	**183**	**158**
VE5AEO	**14**	**30,692**	**140**	**114**
SP9EWO	**14**	**27,888**	**156**	**112**
HAØDR	**14**	**20,703**	**131**	**103**
HA5CQ	*	16,320	90	85
UAØKCL	**14**	**12,460**	**74**	**70**
EA3AMV	*	11,176	95	88
YO4ATW	**14**	**8,190**	**70**	**63**
NI3I	**14**	**3,640**	**38**	**35**
SP2UUU	*	1,550	33	31
KBØEVM	**14**	**143**	**13**	**11**
UA4SKW	**7**	**79,002**	**207**	**171**
DL1DQY	**7**	**39,032**	**141**	**119**
W8QZA/6	**7**	**5,076**	**49**	**47**
UX2MF	**3.7**	**115,670**	**273**	**215**
YL1ZF	**3.7**	**67,200**	**212**	**160**
SP4GFG	**3.7**	**30,856**	**140**	**116**
YO9IAB	**3.7**	**2,590**	**39**	**37**
JH1GNU	**3.7**	**2,430**	**33**	**30**
OK1FWR	**3.7**	**704**	**22**	**16**
EU2MM	**1.8**	**20,864**	**131**	**32**
YO4FRF	**1.8**	**6,200**	**59**	**50**
SP5NOG	**1.8**	**450**	**15**	**15**

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		(Op: AA1ND)		
NB1B	**A**	**4,212,252**	**1862**	**726**
K5ZD	**A**	**3,324,540**	**1586**	**670**
KZ1K	*	520,352	606	404
		(Op: K1PLX)		
N1TMG	*	309,738	382	286
N1TZW	*	40,764	152	129
WR1X	*	3,861	40	39
K1DWQ	**14**	**455,344**	**471**	**382**
KE1Y	**3.7**	**1,280,912**	**980**	**446**
***WS1A**	**A**	**1,043,952**	**780**	**478**
***KD1YN**	**A**	**518,367**	**524**	**393**
*N1PGA	*	330,885	386	285
*N1RDJ	*	224,028	323	252
*KB1KM	*	200,448	302	232
*KD1TM	*	199,584	338	252
*KB1YA	*	188,568	293	216
*K8JLF/1	*	158,603	261	199
*N1DFD	*	1,736	31	31
N1CC	**A**	**624,400**	**645**	**400**
KF2LC	**A**	**503,200**	**573**	**400**
K2QMF	*	422,382	433	303
KF2O	*	297,296	368	272
WR2V	*	183,951	297	243
W2OMV	*	153,664	288	224
KB2DE	*	105,281	226	187
K2ONP	*	28,392	104	91
KG2BI	*	6,728	62	58
W2EZ	*	2,400	42	40
WM2V	**7**	**286,896**	**452**	**258**
***NA2Q**	**A**	**551,642**	**611**	**433**
***N2INN**	**A**	**428,869**	**453**	**323**
*KG2AU	*	184,314	309	221
*N2JIX	A	172,040	299	230
*K2UF	*	153,031	265	199
*KB2RAS	*	136,713	270	229
*N2PEB	*	135,048	255	204
*N2NYR	*	31,928	117	104
*AA2GS	*	27,768	105	89
*N2LQQ	*	19,688	101	92
*N2MBM	*	5,896	44	41
*KF2ZO	*	3,108	74	42
*KF2YX	*	2,604	45	42
*WAØKIR	*	1,802	38	34
*WB2DVU	*	350	12	8
***K2BQW**	**14**	**185,072**	**310**	**269**
*WB2BTJ	*	13,041	70	63
***W2FGY**	**7**	**17,864**	**58**	**58**
KQ2M	**A**	**5,281,200**	**2174**	**810**
K3ZO	**A**	**4,919,772**	**2158**	**793**
N5OKR	**A**	**1,350,701**	**939**	**527**
KB3AGZ	*	114,359	240	217
N3QOL	*	11,440	69	65
N3HBX	**14**	**1,422,408**	**1166**	**564**
WA3DMH	*	145,552	300	242
AI3Q	*	68,474	171	146
W3FQE	*	4,524	40	39
W3GH	**7**	**775,390**	**765**	**385**
K3ND	*	20,880	63	60
***K1HTV**	**A**	**1,319,490**	**984**	**543**
***KQ3V**	**A**	**308,142**	**414**	**306**
*KB3AFT	*	121,651	387	239
*WV3B	*	103,092	272	213
*N3BDA	*	94,864	211	154
*KE3TA	*	67,332	208	181
*KD3AQ	*	31,808	131	112
***WB2BZR/3/T**	**28**	**9,735**	**105**	**55**
***WA3RSK**	**3.7**	**355,752**	**573**	**324**
KM9P	**A**	**4,959,552**	**2379**	**832**
KI4HN	**A**	**3,026,079**	**1661**	**729**
WZ4F	**A**	**2,875,037**	**1837**	**737**
WZ3Q	*	2,501,935	1517	617
KA4RRU	*	2,331,348	1593	692
K4VUD	*	1,756,412	1433	596
AI2C	*	1,415,910	1084	545
KB4GID	*	734,801	753	433
W4NTI	*	194,000	320	250
KR4EY	*	138,226	246	206
KØEJ	*	134,692	329	223
W1ENZ	*	70,135	208	169
W4WKQ	*	64,566	221	153
N4UH	*	51,834	129	106
N4LZL	*	40,817	143	119
N4MM	*	17,556	80	76
WA4ORG	*	12,033	71	63
W4YV	**28**	**29,889**	**159**	**81**
N4BP	**21**	**156,123**	**409**	**249**
KY2P/4	*	47,888	209	146
AE4MH	**14**	**36,575**	**154**	**133**
KW4T	**7**	**108,570**	**191**	**165**
KC4YM	*	103,752	173	132
AE4MJ	**3.7**	**36,736**	**210**	**164**
AC4NJ	**1.8**	**32,606**	**184**	**137**
AA4MM	*	14,280	153	105
K4JYO	*	1,804	52	41
***WA4ZXA**	**A**	**670,338**	**668**	**446**
***WA4JUK**	**A**	**150,442**	**286**	**214**
*KD4IBI	*	136,620	279	220
*KS4XG	*	111,320	242	184
*W4VGL	*	106,600	265	200
*K4BAI	*	89,760	234	160
*WB4VIM	*	86,846	206	173
*WO4L	*	43,815	137	127
*KI4KR	*	36,295	123	119
*N4EUK	*	10,032	76	66
*K4UK	*	7,230	54	50
*W4OGG	*	3,999	31	31
***WB4HFL**	**28**	**6,580**	**65**	**35**
*W9CNF/M4	*	410	14	10
***AC1O**	**21**	**49,558**	**199**	**142**
*KI4DC	*	8,512	82	64
***N4MO**	**14**	**638,990**	**638**	**407**
***W4YDD**	**7**	**32,364**	**99**	**93**
KN5S	**A**	**139,628**	**485**	**268**
NW5H	**A**	**126,882**	**419**	**266**
W5EIJ	*	13,860	73	70
KN5H	*	8,800	89	80
WD5IQA	*	7,301	56	49
KC5LQL	*	3,441	45	37
N5NMY	**28**	**67,084**	**269**	**124**
KC5IIP	*	2,622	25	19
W5ASP	**21**	**99,180**	**303**	**190**
K5UA	**14**	**1,263,032**	**1304**	**629**
K5YAA	*	394,107	547	383
K5OC	*	70,590	210	181
KØBCN/5	*	7,344	80	72
***WD5K**	**A**	**706,200**	**670**	**440**
***NY5B**	**A**	**674,422**	**931**	**469**
*NZ5O	*	477,500	655	382
*NT5D	*	343,924	611	346
*AB5SE	*	260,477	410	293
*WK5K	*	73,100	255	170
*N5XUS	*	71,400	228	175
***N5NMX**	**28**	**24,528**	**140**	**73**
***KB5FZO/T**	**28**	**5,994**	**72**	**37**
***W5RNF**	**14**	**70,034**	**230**	**194**
*AC5GH	*	35,462	139	119
***WA5JWU**	**7**	**8,320**	**42**	**40**
***N5IA**	**1.8**	**4,350**	**112**	**75**
K6HNZ	**A**	**1,851,300**	**1563**	**612**
W6TKF	**A**	**1,406,674**	**1293**	**614**
NW6S	**A**	**1,148,811**	**1139**	**569**
KM6YX	*	1,066,114	1139	542
KC6X	*	1,056,783	1160	553
KG6LF	*	1,002,600	1338	600
AB6YL	*	343,791	470	321
KD6QK	*	188,552	417	296
N6AZR	*	178,422	357	227
K6SMH	*	122,400	277	225
KG6AO	*	107,508	251	186
WB6NFO	*	102,265	300	181
K6DR	*	76,160	207	160
KA6BIM	*	35,672	107	98
WA6FIT	*	7,000	55	50
N6IFW	28	36	3	3
N6MU	**21**	**266,760**	**554**	**342**
AB6WD	**14**	**132,842**	**339**	**254**
KK6XN	**7**	**1,003,968**	**752**	**332**
W7CB/6	*	52,480	114	82
KN6DV	**1.8**	**352**	**17**	**16**
***KJ6HO**	**A**	**483,912**	**679**	**396**
***AE6Y**	**A**	**341,376**	**675**	**381**
*W6IXP	*	106,506	261	183
*KK6RG	*	104,372	265	194
*KD6DAE	*	94,500	263	180
*KE6UP	*	67,348	206	149
*KN6DQ	*	66,682	222	154
*N6SMW	*	60,900	209	140
*W6PLJ	*	50,120	177	140
*KQ6ES	*	30,976	153	121
*KO6IS	*	30,858	117	111
*AA6EE	*	22,577	128	107
*N6NF	*	20,000	117	100
*K6CEO	*	9,685	74	65
***WA7BNM/6**	**21**	**134,096**	**479**	**272**
*NP4IW/WX6	*	28,886	189	143
*KU6T	*	24,794	125	98
***K6SG**	**14**	**83,694**	**202**	**174**
*N6WR	*	23,973	148	131
K7RI	**A**	**2,983,572**	**1824**	**716**
			(Op: AA7FT)	
K7QQ	**A**	**2,735,016**	**1573**	**664**
NB7N	**A**	**1,734,486**	**1284**	**601**
KS7T	*	443,724	636	412
W7KPD	*	376,936	624	371
KA7PNH	*	337,020	822	411
KC7UP	*	226,520	368	280
W7HS	*	105,432	238	191
K7ABV	*	51,858	150	129
AA7WP	*	21,200	100	80
W7TSQ	*	8,909	69	59
W7FP	**14**	**606,618**	**775**	**503**
K6ELX/7	*	382,928	617	364
W7AYY	*	90,288	228	198
AB6ZV/7	**3.7**	**809,432**	**892**	**362**
***W7ZMD**	**A**	**495,112**	**642**	**398**
			(Op: WA7NIY)	
***W7QN**	**A**	**126,768**	**396**	**278**
*W7YS	*	25,680	132	107
*KD4HXT/7	*	20,072	133	104
*W7YAQ	*	1,449	23	23
***AA7UN**	**14**	**444,788**	**620**	**422**
KW8N	**A**	**3,183,530**	**1736**	**730**
WZ8T	**A**	**533,169**	**607**	**403**
WB8ENR	**A**	**499,617**	**586**	**387**
AA8PA	*	444,636	480	358
NE8Z	*	349,305	420	319
WB8O	*	116,390	271	226
K8CV	*	57,531	167	151
N8AA	*	21,021	102	91
W8IDM	*	16,195	86	79
WB8MWI	*	12,272	62	59
W8WG	*	1,218	21	21
N8II	**14**	**1,515,816**	**1125**	**569**
KD8SQ	*	98,208	215	186
KG8QT	**7**	**1,120**	**20**	**16**
***NE8I**	**A**	**362,454**	**422**	**313**
***KG8PE**	**A**	**303,222**	**415**	**291**
*W8UPH	*	237,846	370	294
*N8QVP	*	125,086	275	221
*K8LJG	*	84,240	194	162
*K8OLK	*	80,995	184	167
*WB8BUQ	*	25,925	98	85
*AA8SM	*	24,926	115	103
*AL7PT/NK8	*	20,374	140	122
*W8ILC/M	*	6,250	51	50
***KB8IBS**	**14**	**238,620**	**353**	**291**
*KA8OUT	*	4,560	41	38
***N8LIQ**	**7**	**19,750**	**86**	**79**
KBØC	**A**	**530,221**	**556**	**379**
WE9A	**A**	**142,303**	**271**	**203**
KF9VJ	*	7,812	71	63
WX3N/9	*	5,888	50	46
W9IXX	*	2,490	30	30
W9RE	**21**	**46,032**	**176**	**137**
W8SJU	**14**	**143,994**	**282**	**233**
K9UQN	*	55,522	157	142
KA9ZZT	*	6,171	55	51
***KF9YH**	**A**	**190,575**	**308**	**231**
***NG9L**	**A**	**87,711**	**200**	**169**
*WA9CCQ	*	70,035	188	145
*AA9CG	*	35,047	149	101
*N9OGE	*	14,094	110	87
***N9LCR**	**14**	**92,352**	**232**	**192**
*W9JOO	*	60,198	176	158
*WB9DHJ	*	12,352	72	64
***AA9IA**	**7**	**40,960**	**150**	**128**
***K9FOH**	**3.7**	**19,584**	**72**	**68**
WAØOZP	**A**	**10,773**	**72**	**63**
WØPPF	**14**	**33,221**	**139**	**122**
KVØQ	**7**	**1,629,744**	**1008**	**456**
KØJN	*	150,920	188	154
NIØS	*	6,804	45	42
KØCS	**1.8**	**2,622**	**68**	**57**
***ACØW**	**A**	**601,344**	**677**	**432**
***AAØSQ**	**A**	**386,284**	**513**	**359**
*AAØUJ	*	52,608	161	128
*KBØMWV	*	3,304	59	59
***AKØA**	**14**	**389,994**	**645**	**418**

JAMAICA

***6Y5DA**	**A**	**221,117**	**412**	**233**

MARTINIQUE

FM5CD	**14**	**3,819,216**	**2098**	**753**

BARBADOS

***8P6CV**	**A**	**124,387**	**245**	**173**

HAITI

HH2PK	**A**	**11,634,343**	**3970**	**889**
			(Op: 9A3A)	
HH2PKB	**21**	**21,120**	**119**	**80**
***4V2B**	**7**	**1,206,200**	**746**	**370**
			(Op: HH2B)	

PANAMA

***HP1DGX**	**21**	**168,510**	**548**	**274**

GRENADA

***J37LK**	**14**	**8,607**	**59**	**57**

ALASKA

NL7DU	**A**	**20,746**	**91**	**82**

PUERTO RICO

WP4LNY	**A**	**135,936**	**271**	**177**

COSTA RICA

TE1C	**3.7**	**2,161,568**	**924**	**496**
			(Op: TI2CF)	

BELIZE

V31ML	**A**	**56,516**	**196**	**142**

CANADA

VD3EJ	**A**	**9,640,540**	**3150**	**910**
VO1MP	**A**	**3,408,480**	**1682**	**648**
VG3CRC	*	3,236,322	1668	642
			(Op: VE3XL)	
VE7IN	**A**	**2,324,080**	**1296**	**556**
VY2LI	**A**	**2,299,752**	**1338**	**567**
VD3IY/7	*	1,682,208	1058	531
VE3KPU	*	587,496	545	364
VO1DC	*	398,128	460	298
VE1RJ	**A**	**170,317**	**283**	**203**
VE7XO	*	128,820	208	190
VE4RP	**A**	**126,600**	**228**	**200**
VE1RAA	**21**	**76,867**	**205**	**139**
VD5RA	**14**	**1,910,016**	**1459**	**576**
VE7NKI	**14**	**1,268,458**	**1145**	**499**
VE2OTT	**14**	**791,710**	**735**	**410**
VE2KAD	*	169,344	257	252
CY7A	**7**	**5,971,896**	**2096**	**574**
			(Op: VE7SV)	
VD7NTT	**7**	**4,379,200**	**1663**	**544**
VC3MG	**3.7**	**871,320**	**767**	**318**
VD7UBC	**3.7**	**47,288**	**152**	**92**
***VD7CFD**	**A**	**459,266**	**679**	**277**
*VE7TLK	*	403,841	652	283
***VD2AWR**	**A**	**361,504**	**437**	**286**
***VD3EL**	**A**	**169,686**	**278**	**198**
*VA3SWG	*	166,530	296	195
*VE2SAI	*	62,322	181	141
***VE4DXR**	**A**	**56,742**	**167**	**147**
*VE4YU	*	54,626	162	143
***VE9ZL**	**A**	**35,370**	**110**	**90**
*VE3STT	*	7,560	59	54
***VE6BMX**	**14**	**411,412**	**610**	**326**
***VD5GC**	**14**	**151,515**	**395**	**195**
***VC3JFF**	**14**	**34,866**	**140**	**117**
***VE2XAR**	**14**	**18,240**	**88**	**80**
***VE2JTX**	**3.7**	**84,868**	**227**	**131**
***VE3OIL**	**3.7**	**16,482**	**72**	**67**

MONTSERRAT

***VP2MGF**	**A**	**964,992**	**1150**	**384**
		(Op: WB9HRO)		

TURKS AND CAICOS

***VP5JM**	**3.7**	**146,624**	**221**	**158**

MEXICO

***XE3LMV**	**A**	**172,284**	**349**	**196**
*XE1HKR	*	4,816	44	43
***XE1BEF**	**14**	**486,093**	**765**	**311**
***XE2DV**	**7**	**2,414,320**	**1229**	**412**
			(Op: W7ZR)	
*XE2AC	*	9,540	48	45

AFRICA
TUNISIA

3V8BB	**A**	**12,318,912**	**3670**	**864**
			(Op: YT1AD)	

NIGERIA

5NØT	**A**	**6,043,488**	**2300**	**776**

UGANDA

***5X4F**	**A**	**1,201,868**	**910**	**452**

KENYA

***5Z4BJ**	**21**	**59,163**	**164**	**123**

SENEGAL

6V6U	**14**	**4,960,836**	**2255**	**738**
			(Op: K3IPK)	

BURUNDI

***9U/EA1FH**	**A**	**2,635,218**	**1585**	**562**

GHANA

9R1A	**21**	**4,728,856**	**2171**	**748**
			(Op: PA3DZN)	

ZAIRE

9Q5OWB	**A**	**47,508**	**159**	**107**
			(Op: F5OWB)	

CANARY ISLANDS

EA8AH	**7**	**7,101,380**	**1667**	**715**
EA8AN	*	8,260	40	35
EA8EA	**3.7**	**1,043,460**	**516**	**341**
***EA8BXD**	**A**	**99,450**	**208**	**150**
***EA8AKN**	**21**	**1,500,741**	**1044**	**489**
*EA8BXQ	*	120,411	235	153
***EA8AD**	**14**	**162,197**	**275**	**203**

CEUTA & MELILLA

EA9KB	**A**	**902,472**	**705**	**372**
***EC9AX**	**A**	**19,980**	**80**	**74**

GUINEA BISSAU

J56CK	**21**	**3,769,600**	**2050**	**620**
			(Op: I4LCK)	

CAMEROUN

TJ1RA	**A**	**1,511,552**	**1061**	**482**

Say You Saw It In CQ

CQ knows that some things... ...a ham's just got to have!

1

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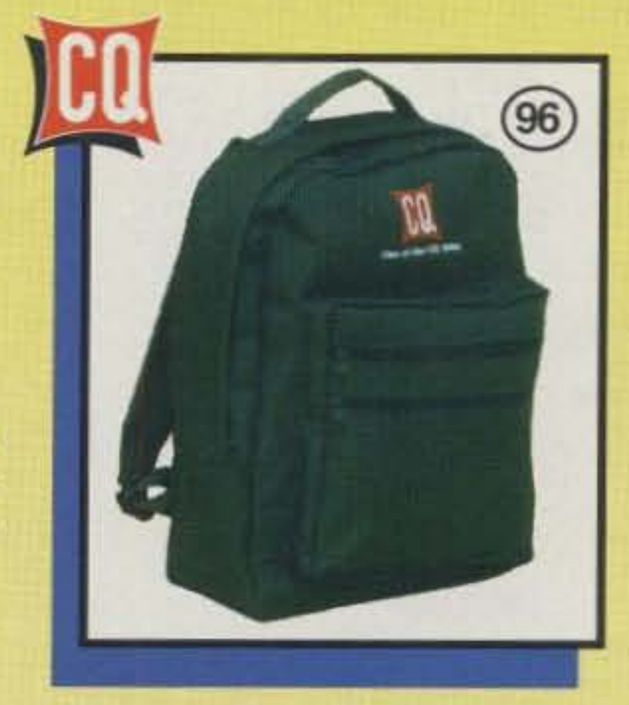
6

A MUST FOR EVERY HAM

This hat says that you're a part of the world's greatest hobby! Poplin cap with adjustable strap has 5 panels with fused buckram backing, 1/4" thick braid and a visor with eight solid rows of stitching.

Order No. : 97N (Navy), 97G (Green), 97B (Black) $12.00

GO AHEAD! LOAD IT UP!



Load it up with all your ham "stuff." This useful and rugged backpack will be your greatest asset when carrying around your ham accessories. Embroidered design, 2 front pockets.

Order No.: 96N (Navy), 96G (Green), 96B (Black) $25.00

These popular mugs were designed with you in mind. Add one to the ham shack or get a set for the house. These sturdy white porcelain mugs hold 11 oz.

Available with leather coasters too!
Get one or a set of 4!

CQ Mug Order No. 98 .....$7.00
Pop Comm Mug Order No. 99 .....$7.00
Single Coaster Order No. 93.....$2.00
Set of 4 Order No. 93S $7.00

HEAVYWEIGHT!

This oversized glass stein holds a whopping 19 oz. With CQ's logo etched into the heavyweight glass, this collectable will look great forever!

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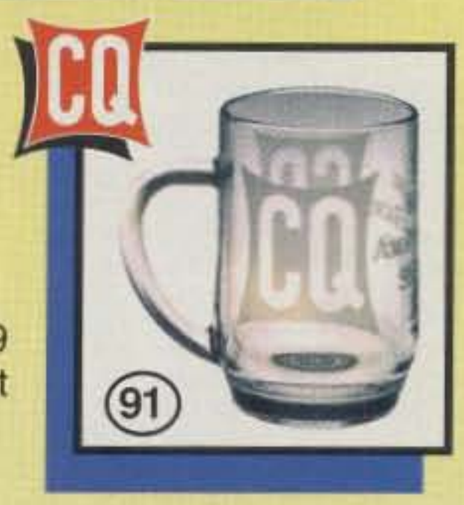
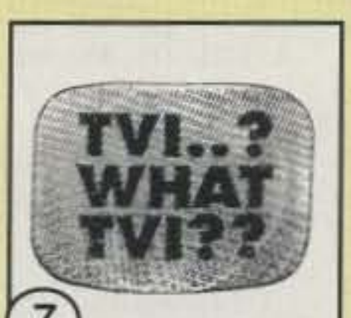


Phone: 516-681-2922

FAX: 516-681-2926

If ordering by fax: please include your name and address; credit card number and the name, size color and item code of the products you want.
If ordering by mail: please include the same information as if ordering by fax and mail to CQ Communications, Inc., 76 N. Broadway, Hicksville, NY 11801
Payment Methods: We accept personal checks and money orders (U.S. funds only). We also accept Visa, MasterCard, Discover, and American Express.
Shipping and handling charges are as follows: $2.00 s/h for orders under $20.00, for orders of $20.00 to $50.00 add $4.00, **Free** shipping on orders of over $50.00.
Sales Tax: NY State residents add applicable sales tax.

T Shirt Sizes come in L, XL and XXL (add $2.00 for XXL)



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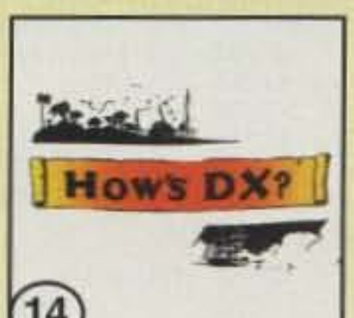

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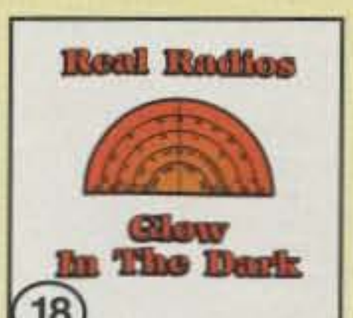

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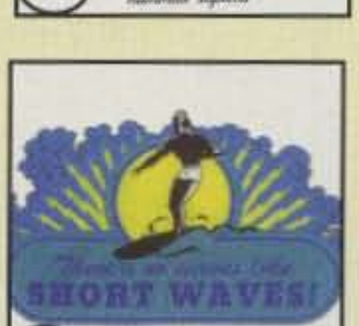

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ZAMBIA

Z21KD	A	274,131	643	143

SOUTH AFRICA

ZS4WD	A	161,600	280	200
ZS6BRH	21	228,806	334	233
ZS6SA	14	691,464	631	376
ZS6IR	7	8,960	42	40

ASIA

ISRAEL

4Z1UF	A	3,174,654	1825	577
4X/OK1JR	21	847,926	957	306
*4X1VF	14	522,720	600	297
*4Z5FW	14	37,024	120	104

KUWAIT

9K2HN	A	823,592	759	392
*9K2/YO2HP	A	2,435,862	1701	501

MALAYSIA

*9M2TO	A	673,880	1187	340

PEOPLE'S REP. OF CHINA

*BY1QH /K1VWL	A	119,064	325	164
*BG4DW	7	12,800	86	64

KOREA

*HL5AP	A	7,320	64	60

THAILAND

HS5ØA	A	2,503,386	2072	606
		(Op: K3WUW)		

JAPAN

JA7BEW	A	636,174	625	374
JAØQWO	A	100,285	231	155
JE3HVL	"	98,600	225	170
JA5IP	"	23,147	102	79
JAØHYU	"	14,740	73	67
JR6CF	"	4,160	40	40
JA1AAT	"	2,926	65	59
JA2QVP	"	1,680	24	21
JI2UNR	21	140,448	338	224
JA7DAH	14	630,404	674	359
JA2BNN	14	625,148	650	373
JA7YFB	"	604,675	627	361
		(Op: JM1HBO/7)		
JA5APU	"	328,601	421	299
7J1AQH	"	218,328	341	264
		(Op: VE7HA)		
JAØFVU	"	600	10	10
JA7FFN	7	2,552	24	22
JA3CE	"	310	11	5
JAØJHA	3.7	335,384	383	226
JA2DLM	"	2,714	24	23
*JI3BFC	A	347,800	468	296
*7K3OWM	A	336,050	435	286
*JH1UUT	A	231,250	363	250
*JA7KBR/1	"	226,333	347	239
*JA6SRB	"	206,112	324	226
*JH4NMT	"	169,176	276	212
*JA1GYO	"	137,825	264	185
*JF3IUC	"	95,858	248	167
*JE1UFF	"	76,664	200	148
*JN2AMD/2	"	72,224	200	148
*7J1ABD	"	71,808	170	132
		(Op: WA6URY)		
*7J1AUD	"	59,305	190	145
		(Op: KD5YG)		
*JG3UVN	"	38,940	127	118
*JA5EO	"	38,532	126	114
*JR1MRG	"	26,896	116	82
*JA1QN	"	22,761	101	81
*JAØTEA/9	"	21,024	105	73
*JA2GHP	"	15,400	96	70
*JG5OYU	"	10,556	71	58
*JA1AB	"	9,680	72	55
*7K2QOX	"	7,791	50	49
*JR1GGB	"	7,500	60	51
*JG1RDV	"	6,552	41	36
*JH2WHS	"	5,040	49	45
*JI1RCB	"	4,560	46	38
*JH4WBY	"	4,120	42	40
*JA4CZM	"	4,107	40	37
*JI3MVO	"	3,010	40	35
*JA8TEZ	"	2,670	34	30
*JG1EHF	"	972	18	18
*JJ1LRD	"	544	16	16
*JH6AUS	28	7,150	77	55
*JF6OJX	"	4,895	75	55
*JS1KQQ	"	884	20	17
*JA1VVH	"	828	24	23
*JA5PEE	"	525	18	15
*JRØBQD	"	275	12	11
*JI4HKA	"	65	5	5
*JJ6VXY/9	"	27	5	3
*7N3ULM	21	41,730	167	130
*JR9NVB	21	37,908	145	117
*JE1XCZ	"	29,868	138	114
*JA3LEZ	"	21,384	106	88
*JA6BIF	"	18,700	97	85
*JL2HUJ	"	17,108	108	91
*JR7LVK	"	13,510	81	70
*JQ1BNL	"	12,670	78	70
*JL1MWI	"	11,328	76	64
*JHØEPI	"	9,464	73	56
*JE9PFD	"	8,892	68	57
*JH3FTZ	"	7,076	64	58
*JH8DHV	"	5,724	60	54
*JA1XPU	"	5,246	46	43
*JF2PXB	"	3,724	40	38
*JL3IVX	"	3,627	43	39
*JA2IZA	"	3,367	37	37
*7K1EQG	"	2,664	39	37
*JR3CVJ	"	2,574	36	33
*JR3KAH	"	2,310	33	30
*JG1GCO	"	1,539	27	27
*JM2BHI	"	286	11	11
*JH1RMH	"	260	10	10
*7M2MIK	"	238	22	14
*JA1JLP	"	105	36	35
*JH7VHZ	14	1,075,778	877	457
*7M1MCT	14	578,733	585	379
*JI1FDF	"	312,570	408	302
*JH6SQI	"	153,725	286	215
*JA1BRL	"	75,306	186	154
*JA9KUG	"	60,590	166	146
*JE1LFX	"	46,986	156	123
*JR2LIS	"	35,298	136	111
*JA2CWU	"	25,414	114	97
*7N2UQC	"	11,352	75	66
*JE9HVF	"	3,885	40	37
*JAØGZ	"	2,635	35	31
*JA7AXP	"	1,716	26	26
*JA1KI	"	1,113	23	21
*JA6QDU	"	1,092	23	21
*JJ1NUI	"	748	20	17
*JA3HPD	"	600	17	15
*JH1UES	"	192	12	12
*JG1FGL	"	1	1	1
*JS1OYN	7	31,200	88	78
*JA2GTW	"	12,838	55	49
*JA1NYV	"	12,000	51	50
*JE9REN	"	504	14	14
*JE1SPY	3.7	1,386	24	21
*JA6WFM	"	780	15	15

LEBANON

OD5NJ	A	4,032,536	1793	596
*OD5JY	14	600,831	694	297

TURKEY (ASIATIC)

YM2ZW	14	2,562,296	1823	484
*TA2DS	A	322,392	340	228

ASIATIC RUSSIA

UAØSJ	A	920,565	1299	405
RAØAM	"	86,292	200	153
UAØWL	"	261,498	379	246
UAØWY	14	1,625,820	1137	588
RVØAR	7	1,699,968	961	456
*RSØF	A	162,060	283	222
UA9XEN	A	373,737	388	273
RA9FDR	"	307,632	351	232
RA9JW	"	207,230	317	230
RA9XF	"	192,666	259	197
RZ9WX	"	163,076	270	236
RA9DX	14	1,372,028	971	532
UA9AR	3.7	55,100	106	95
*RA9AE	A	627,984	505	294
*RW9QA	"	348,964	394	242
*RW9WF	"	97,968	202	157
*UA9CL	"	64,780	183	79
*RN9XA	14	102,486	212	174

TURKMENISTAN

*UK8IG	A	142,628	296	197

KAZAKHSTAN

UN2O	A	538,752	463	244

HONG KONG

VR2RX	A	122,843	600	161
		(Op: JR1JCB)		

VIETNAM

3W5FM	A	29,376	253	108

MACAO

XX9TSS	21	84,623	512	157
		(Op: JK2PNY)		

CYPRUS

*ZC4EE	A	1,024,860	925	372

EUROPE

CROATIA

9A3SC	A	149,617	351	221
9A1CFZ	"	756	18	18
9A3MA	21	22,041	86	79
9A2CY	14	407,612	621	362
9A3UF	"	13,559	97	91
9A1CDH	"	5,184	62	54
		(Op: 9A4RV)		
9A2VN	"	2,880	38	36
9A1CRJ	7	913,080	833	420
		(Op: 9A4LA)		
9A2TW	1.8	176,784	355	232
*9A4RU	A	165,130	339	245
*9A2KO	"	100,352	232	224
*9A3ZO	"	9,394	75	61
*9A4D	7	248,640	381	259
*9A3QK	3.7	202,184	401	254

MALTA

9HØDX	A	2,622,187	2541	661
		(Op: DK9IP)		
*9H3YY	A	40,004	210	146
		(Op: DK9DA)		

PORTUGAL

CQ4DIZ	A	5,183,808	2656	812
CT1CFI	"	324,896	630	352
CQ7AUO	"	191,874	364	283
CT1DSJ	"	72,912	287	196
CT1BNW	14	56,784	192	169
*CQ7ELP	A	787,436	962	494
		(Op: CT1ELP)		
*CS5END	"	19,950	160	114
*CT1ERK	28	3,068	40	26
*CT1ETE	21	66,265	199	145
*CT4NC	14	6,510	77	70

AZORES

CU3FQ	A	954,856	948	476
CU3AV	"	101,728	236	176

GERMANY

DL1NCT	A	1,027,621	906	511
DK1QH	A	991,820	998	505
DL2DXX	A	836,864	746	448
DJ8UV/P	"	563,340	737	410
DL8AAE	"	531,136	622	386
DL8UCC	"	464,464	519	364
DL3JMM	"	329,294	600	301
DJØPN	"	188,082	424	258
DF5NF	"	173,160	354	260
DK7YY	"	145,400	313	200
DL1LOD	"	113,090	268	215
DL7VRO	"	104,910	311	195
DL5JJF	"	79,119	240	177
DL3DBY	"	71,919	251	183
DL6DVU	"	62,730	220	170
DL9GMN	"	40,745	160	145
DK5KJ	"	15,486	107	87
DL8PC	14	1,491,165	1139	585
DJ2YE	7	41,750	145	125
DL5AUJ	7	2,580	31	30
DL4LAX	3.7	37,252	154	134
DL4WA	"	24,360	143	105
*DLØIU	A	949,160	981	488
		(Op: DL2OBF)		
*DL6KY	A	480,445	501	371
*DL8BEV	A	412,920	610	360
*DL3JAN	"	397,460	598	340
*DL8AAM	"	362,724	566	334
*DK3WW	"	356,720	488	343
*DL5IO	"	178,712	367	251
*DL2RMS	"	175,750	468	250
*DL1BFZ	"	166,616	303	236
*DL8SDC	"	161,544	340	254
*DL1RNH	"	144,460	352	233
*DL5PW	"	107,916	250	204
*DL8UVG	"	70,705	240	179
*DL1TS	"	55,945	209	167
*DL2YAK	"	54,605	217	163
*DL8ULO	"	51,340	212	151
*DL2TG	"	48,260	150	127
*DL6ECA	"	45,758	172	137
*DF8WC	"	41,600	177	128
*DL6HBQ	"	34,060	154	130
*DL2GBB	"	31,000	145	125
*DF8LZ	"	25,300	121	110
*DL5WS	"	25,245	113	99
*DL9NEI	"	15,390	100	90
*DL7UHD	"	14,382	104	94
*DL2DRM	"	6,864	72	52
*DL7YS	"	2,691	39	39
*DJ6QO	"	494	19	19
*DL3SEM	21	33,966	134	102
*DF7YU	14	219,934	404	286
*DJ9ZB	"	36,418	152	131
*DJØBX	"	15,500	124	100
*DL9ZWG	"	9,443	81	71
*DL1FDV	7	493,506	536	351
*DL4FMA	3.7	407,376	662	328
*DH7ACI	"	30,226	149	119
*DH4JQ	"	10,206	81	63
*DJ5NN	1.8	4,992	59	52

SPAIN

EA3GHQ	A	1,641,932	1175	601
EA1UX	A	1,395,756	1337	566
EA5AL	"	677,128	710	424
EA1JO	"	205,779	382	287
EA5AEN	"	74,892	192	158
EA7BR	"	39,767	146	146
EA5JC	"	27,120	124	113
EA1BNW	"	23,520	110	105
EA5RC	"	19,998	117	101
EA5AHK	"	19,691	99	97
EA4IF	"	15,842	102	89
EA1DD	"	9,394	99	95
EA4EIS	"	4,350	51	50
EA5GQZ	"	3,564	40	36
EA7BA	28	5,168	53	34
ED5OL	21	85,140	287	180
		(Op: EA5OL)		
EA1US	"	56,474	215	151
EA2BP	"	21,280	125	95
EA2IA	14	1,062,050	1071	550
EA7DHP	3.7	231,136	331	248
EA3ALV	"	103,922	236	182
EA3ELM	"	98,580	244	186
EA5GRB	"	87,894	221	171
*ED3ELZ	A	686,400	753	429
*EA7GTF	A	412,552	600	371
*EA1AYN	"	412,368	582	363
*EA7GXD	"	330,084	481	318
*ED1WPX	"	275,378	460	314
		(Op: EA1DAX)		
*EA3BKI	"	255,360	440	304
*EA5EOR	"	238,764	391	303
*EA2ASB	"	224,580	409	285
*ED5WI	"	220,520	430	298
*EA1MK	"	219,390	443	309
*EA5EYJ	"	213,920	372	280
*EF5CPL	"	180,782	426	259
*EA1FDG	"	106,977	254	211
*EA1AW	"	98,115	275	211
*EA1YB	"	82,095	217	195
*EA1JJ	"	80,848	225	163
*EA3GHZ	"	77,226	213	183
*EA1ABS	"	65,844	201	177
*EA4AKY	"	61,020	250	180
*EA1BLX	"	48,720	173	145
*EA1OT	"	40,500	179	150
*EA3DVJ	"	38,252	160	131
*EA1BAW	"	34,416	156	144
*EF5DX	"	31,992	201	124
		(Op: EC5CWA)		
*EA5HT/2	"	27,798	120	113
*EA7EWX	"	17,325	122	99
*EA3GHB	"	12,495	92	85
*EA3ASX	"	11,868	99	86
*EA1BEZ	"	11,461	76	73
*EA1BLF	"	7,524	58	57
*EA1DLN	"	7,524	58	57
*EA1FBJ	"	3,850	52	50
*EA1WE	"	3,780	42	42
*EA5CRU	"	3,417	52	51
*EA1DFP	"	3,230	37	34
*EA4EOI	"	3,000	42	40
*EA5XN	"	2,980	42	42
*EC4DHD	"	1,100	25	22
*EA3FFE	"	70	10	10
*EA7ALN	28	4,794	51	34
*EF1AA	21	109,894	241	152
*EA3AQR	"	72,063	227	157
*EA3ANM	"	49,209	197	141
*EA1AKP	"	26,226	121	94
*EA7EBL	"	16,036	88	76
*EA1BFZ	"	2,888	38	38
*EA4AUF	"	240	8	8
*EA7AGW	14	729,908	873	502
*ED3PX	"	570,472	800	427
		(Op: EA3FHN)		
*EA1AJV	"	334,220	585	340
*ED7FIU	"	291,828	728	332
*EA7HBP	"	244,720	654	322
*EA5XC	"	104,400	375	240
*EA4DRV	"	84,065	326	215
*EA3AM	"	20,566	120	113
*EA3BD	7	38,150	129	109

BALEARIC ISLANDS

*EA6ACZ	A	43,508	175	149

MOLDAVIA

*ER3AAQ	3.7	76,416	193	192
*ER3HW	1.8	24,354	118	99

ESTONIA

*ES5Q	A	781,704	1000	432
		(Op: ES5RY)		
*ES1BH	A	256,344	459	264
*ES5RW	"	5,280	45	40

BYELORUSSIA

EW4MM	A	709,023	832	399
EU4AA	A	237,720	439	280
EW3LN	"	198,645	393	255
EW8DX	14	207,240	510	264
EW8CM	"	8,976	101	51
EW6TU	3.7	132,800	299	200
*EW6BL	A	11,147	76	71
*EW8DA	"	3,360	42	40
*EW6DX	14	142,845	450	267

FRANCE

F2EE	A	4,180,125	2186	785
F6FGZ	A	3,717,798	1773	714
F8WE	"	755,594	935	434
F8PTT	"	728,000	785	455
		(Op: F5TGR)		
F5UFX	"	441,216	511	384
F2RO	"	251,966	423	286
F5TCN	"	223,938	330	297
F6IJG	"	101,404	280	202
F5TNI	"	63,412	177	166
F2NH	"	48,672	168	156
TM2DX	14	1,274,640	1067	564
		(Op: F6GWV)		
F5DEM	"	8,740	81	76
F5NBX	3.7	633,360	673	364
*F5YJ	A	186,730	367	263
*F6FNA	A	162,560	329	254
*F5RAB	"	155,595	345	253
*F5POJ	"	137,214	351	231
*F/DL5IAM/P	"	113,815	284	221
*F5PCX	"	104,370	267	213
*F5AMH	"	99,115	226	215
*F5PRR	"	90,610	247	221
*F5PXF	"	13,735	130	67
*F6AXD	"	8,024	62	59
*TM9K	21	72,345	229	159
		(Op: F5BEG)		
*F5JDG	7	16,720	102	88
*F5PRH	1.8	61,910	219	151
*F5PYI	1.8	920	24	23

ENGLAND

G4BUO	A	89,776	223	181
GØAEV	28	176	26	16
GX4WSM	7	1,899,792	1474	501
		(Op: G4OJH)		
*G4NXG/M	A	33,292	130	116
*GØKRL	14	80,704	260	208

ISLE OF MANN

*GD/AI5P	14	130,340	316	245

NORTHERN IRELAND

GIØKOW	A	6,160,091	2795	883

SCOTLAND

GM3BCL	A	511,242	566	417
GM6MD	"	500,964	619	383
		(Op: GM4FDM)		
GM4PVC	A	267,600	491	300
GM5VG	"	159,232	394	256
		(Op: GM3UTQ)		

SHETLAND IS.

*GM /DL1EFW/P	A	3,185	55	49

WALES

GW4BLE	A	3,940,732	2004	724

HUNGARY

HA6NL	A	549,010	706	385
HA8IE	14	2,205,240	1516	705
HA1AG	14	1,963,192	1445	616
HG9R	7	2,609,280	1377	604
		(Op: HA9AX)		
*HAØHW	A	311,860	446	310
*HA8IB	3.7	487,770	639	355

SWITZERLAND

HB9HFN	A	210,936	367	264
*HB9ARF	A	83,328	241	186

ITALY

IU2E	A	2,472,666	1577	678
		(Op: IK2VUE)		
IO4A	A	1,832,240	1406	592
		(Op: IK4PVR)		
IO6T	A	1,639,052	1359	593
		(Op: IK6GPZ)		
IKØYUT	"	1,241,009	1128	497
IK4MHB	"	1,151,739	995	531
I6NOA	"	579,840	649	384
IYØTCI	"	336,296	502	331
		(Op: IØKHP)		
IK3OII	"	268,008	413	312
IK6BSN	"	251,896	414	296

Say You Saw It In CQ

IKØWHN	*	54,322	209	157
IK2YQX	*	5,123	50	47
IK8NBL	*	2,924	46	43
IR4R	**21**	**174,956**	**337**	**229**
		(Op: IK4ALM)		
II1C	*	5,074	51	43
IY2ARI	**14**	**3,124,968**	**1914**	**712**
		(Op: I2EOW)		
IV3YYK	**14**	**2,274,616**	**1467**	**628**
II3T	**7**	**3,423,168**	**1489**	**672**
		(Op: IV3TAN)		
IR1A	**7**	**1,576,440**	**1266**	**522**
		(Op: IK1GPG)		
IK8UND	*	739,640	707	410
IK7YUA	*	179,304	332	241
I2AT	*	175,854	338	237
***IKØYVV**	**A**	**394,716**	**561**	**381**
***IK7RVY**	**A**	**273,325**	**420**	**325**
*IK3XZX	*	133,791	191	161
*IK3PQG	*	88,902	240	198
*IK7WPD	*	84,245	264	203
*IK4WMH	*	54,570	200	170
*IK8ODA	*	47,142	198	162
*IK2QPO	*	19,872	100	92
*IK5TBK	*	13,923	82	63
*IKØZME	*	2,292	44	28
***IKØ/SM5DQE**	**14**	**52,002**	**200**	**162**

SARDINIA

***ISØLLJ**	**A**	**59,235**	**198**	**165**
*ISØBKD	*	28,560	153	119

SICILY

***IT9ORA**	**A**	**36,974**	**154**	**133**
*IT9CWJ	*	18,624	122	96
***IR9B**	**14**	**1,862,350**	**1684**	**626**
		(Op: IT9STX)		

NORWAY

LA6BBA	**A**	**367,840**	**682**	**352**
LA2IR	*	363,165	635	355
LA9DFA	*	355,020	362	244
LA2MJA	**14**	**219,030**	**487**	**294**
***LA2JR**	**A**	**177,174**	**233**	**193**
*LA2AD	*	73,283	257	203
*LA9CQ	*	51,590	181	154
*LA5LJA	*	25,908	134	127
*LA7CL	*	21,400	126	107
***LA4GIA**	**21**	**2,697**	**31**	**29**
***LA5JX**	**14**	**24,741**	**126**	**109**
*LA5YJA	*	17,028	114	99

LUXEMBOURG

LX1KC	**7**	**1,244,448**	**1097**	**464**

LITHUANIA

LY5W	**A**	**1,030,710**	**1068**	**470**
LY2PAQ	*	355,756	573	302
LY3BH	**21**	**74,336**	**250**	**184**
LY2BM	**14**	**934,219**	**959**	**517**
LY2BNZ	*	190,530	408	290
LY1FW	**7**	**936,304**	**912**	**421**
LY1DT	*	512,736	679	336
LY6K	**3.7**	**447,208**	**642**	**313**
		(Op: LY3BS)		
LY3NOK	*	23,424	121	96
***LY2FN**	**A**	**460,284**	**653**	**363**
***LY1DC**	**A**	**232,260**	**441**	**294**
*LY2TZ	*	203,934	400	246
*LY3NJ	*	118,160	275	211
*LY3BY	*	116,150	301	230
***LY2AE**	**14**	**97,968**	**285**	**208**
***LY2OU**	**7**	**147,554**	**286**	**209**
***LY2HK**	**3.7**	**20,274**	**111**	**93**

BULGARIA

LZ1BJ	**A**	**137,170**	**351**	**215**
LZ3CW	*	5,888	50	46
LZ7N	**21**	**223,550**	**379**	**263**
LZ7G	**14**	**1,878,840**	**1871**	**612**
		(Op: LZ3ND)		
LZ2OG	*	396,900	420	317
LZ6C	*	159,936	502	224
		(Op: LZ2TF)		
***LZ4BU**	**A**	**9,310**	**75**	**70**
***LZ5QZ**	**14**	**105,512**	**352**	**218**

AUSTRIA

OEM1WWL	**14**	**1,587**	**23**	**23**
OEM8Q	**3.7**	**724,280**	**872**	**380**
***OEM1KYW**	**A**	**304,960**	**520**	**320**
*OEM8CIQ	*	251,424	487	288

FINLAND

OI4OC	**A**	**3,665,936**	**2293**	**778**
		(Op: OH5LF)		
OH1HD	**A**	**2,888,020**	**1822**	**733**
OH6KIT	**A**	**2,696,580**	**1860**	**710**
OI3OJ	*	1,442,912	1501	536
OI1BV	*	772,472	770	446
OH3MMH	*	672,243	821	429
OI6KZP	*	526,162	772	413
OI6YF	*	168,036	356	228
OH2VZ	*	60,555	367	165
OH5LZY	*	8,064	75	64
OH6MRA	**21**	**41,100**	**182**	**137**
OI3LQK	*	32,725	157	119
OH2PM	**14**	**1,754,505**	**1451**	**635**
OI3MFP	**7**	**100,036**	**254**	**178**
OH7MQF	*	20,274	103	93
OI1MLB	**1.8**	**151,200**	**354**	**210**
***OH6SU**	**A**	**107,568**	**230**	**216**
*OI3KCB	*	52,966	196	142
*OH6QP	*	44,982	197	153
*OI7NW	*	31,605	156	129
***OI4KBC**	**21**	**49,280**	**210**	**140**
*OI6KTD	*	29,532	119	92
*OH4JFN	*	26,418	161	111
***OH6RC**	**14**	**1,610**	**38**	**35**

CZECH REPUBLIC

OK1EP	**A**	**481,260**	**504**	**390**
OK1RI	**14**	**4,544,304**	**2238**	**816**
OK1DX	**14**	**1,364,580**	**1065**	**570**
OK2PVF	**3.7**	**343,380**	**571**	**291**
***OK1WF**	**A**	**3,878,263**	**553**	**331**
*OK2DB	*	391,782	506	334
*OK1KZ	*	336,540	526	316
*OK1FKV	*	102,201	292	209
*OK2BQZ	*	93,610	259	185
*OK2PBG	*	51,824	209	161
*OK1KCF	*	46,512	166	136
*OK2EC	*	32,079	135	111
*OK2BDI	*	168	8	8
***OK1ARI**	**21**	**21,590**	**106**	**85**
*OK2QX	*	7,696	60	52
***OK2VWB**	**14**	**104,721**	**296**	**201**
*OK2TBC	*	70,281	250	171
*OK2BJT	*	69,084	240	171
*OK1IR	*	45,844	202	146
***OK2UQ**	**7**	**10,206**	**71**	**63**
***OK2PSA**	**3.7**	**56,964**	**200**	**141**
*OK2PPM	*	25,272	128	108
*OK2SWD	*	19,360	116	88
*OK1MCA	*	6,832	61	56
***OK1NG**	**1.8**	**114,204**	**339**	**186**
***OK1FFU**	**1.8**	**105,376**	**311**	**178**
*OL3Z	*	80,676	233	166
			(Op: OK2HI)	

SLOVAKIA

OM7DX	**A**	**4,410,008**	**2202**	**776**
OM8A	**A**	**4,389,592**	**2146**	**772**
OM5CD	**1.8**	**220,818**	**434**	**247**
***OM6MO**	**A**	**312,526**	**511**	**307**
***OM3YK**	**A**	**278,512**	**388**	**338**
*OM6TX	*	187,944	420	246
*OM3IAG	*	168,315	322	229
*OM3PQ	*	136,572	288	228
***OM4DN**	**7**	**57,918**	**187**	**147**
***OM7V**	**3.7**	**141,192**	**338**	**212**
		(Op: OM7AB)		
*OM3TNI	*	34,200	150	114

BELGIUM

OT6T	**A**	**7,319,598**	**2798**	**898**
		(Op: RA3AUU)		
***ON5GQ**	**A**	**672,153**	**756**	**449**
*ON6CR	*	268,056	440	306
*ON9CCQ	*	242,424	463	296
			(Op: VE3ZZ)	
*ON4CAS	*	220,206	414	294
*ON4XG	*	204,886	392	278
*ON4AEY	*	53,424	203	168
*ON4LAM	*	48,825	178	155
*ON5PJ	*	34,974	155	134
***ON4CU**	**14**	**43,941**	**153**	**151**
***ON7NQ**	**7**	**77,000**	**181**	**154**

FAROE ISLANDS

OY9JD	**1.8**	**213,380**	**427**	**235**

DENMARK

OZ5EV	**A**	**601,965**	**597**	**455**
OZ5YL	*	39,192	156	142
OZ1INN	**14**	**106,169**	**307**	**203**
***OZ2ZZZ**	**A**	**270,973**	**500**	**289**
***OZ7HAM**	**A**	**204,605**	**412**	**271**
*OZ1ACB	*	154,548	351	243
*OZ4NA	*	43,200	172	150
*OZ7AEI	*	27,429	161	123
***OZ8T**	**14**	**25,308**	**134**	**111**
***OZ5ABD**	**3.7**	**10,200**	**76**	**68**
***OZ3SK**	**1.8**	**122,112**	**327**	**192**

THE NETHERLANDS

PAØIJM	**14**	**229,080**	**484**	**276**
PAØCOR	*	70,952	213	181
PAØMIR	**3.7**	**122,180**	**285**	**205**
***PA2ALF**	**A**	**61,060**	**213**	**172**
*PA3DUS	*	59,052	149	133
*PAØKDM	*	52,540	177	142
*PA3AEB	*	23,296	139	112
*PA3GPQ	*	17,578	106	94
*PAØSMS	*	2,104	54	46
***PA3GAB**	**14**	**21,390**	**132**	**115**
***PA2SWL**	**3.7**	**138,260**	**300**	**223**

SLOVENIA

S5ØA	**A**	**7,961,022**	**2886**	**905**
S59A	**A**	**4,597,645**	**2137**	**845**
S58AB	**A**	**4,501,896**	**2070**	**762**
S56A	*	572,544	620	384
S58MU	*	27,945	130	115
S51AY	**28**	**4,823**	**69**	**53**
S5ØD	**21**	**220,980**	**404**	**254**
		(Op: S57AD)		
S5ØR	**14**	**2,066,206**	**1436**	**634**
S59L	**14**	**2,045,920**	**1460**	**608**
S53BM	*	848,615	904	445
S57C	*	9,900	80	75
S52CO	*	5,202	55	51
S53M	**7**	**2,677,164**	**1398**	**609**
		(Op: S51ZO)		
S59ZA	*	841,824	797	416
S57DX	**3.7**	**1,070,244**	**1118**	**434**
S51AG	**3.7**	**918,996**	**943**	**411**
		(Op: S55AM)		
S57M	*	854,864	957	404
S57O	*	842,928	864	408
S52ZW	*	746,880	892	389
S58AM	*	694,762	829	383
S51FB	*	603,592	738	361
S51Z	*	569,058	735	357
S54E	**1.8**	**382,910**	**614**	**295**
***S53DX**	**A**	**72,802**	**230**	**178**
***S57T**	**14**	**1,055,574**	**962**	**507**
***S58J**	**7**	**232,426**	**396**	**257**
***S57J**	**3.7**	**423,752**	**570**	**329**
*S57KNC	*	177,120	368	240
*S54A	*	174,720	351	240
*S57FYL	*	156,312	345	234
*S57MBR	*	124,982	304	209
*S57LOB	*	120,540	315	210
*S57MSU	*	89,776	277	181
*S51SLO	*	51,240	199	140
			(Op: S57LZA)	
***S5ØO**	**1.8**	**131,460**	**317**	**210**

SWEDEN

SM5CSS	**A**	**25,792**	**119**	**104**
SM5AAY	*	24,633	135	119
SM5OK	*	19,392	106	96
SMØKV	**21**	**9,420**	**67**	**60**

CABLE X-PERTS, INC.

COAX (50OHM"LOW LOSS" GROUP) — 100FT/UP / 500FT / 1000FT

"FLEXIBLE" 9913 STRD BC CNTR FOIL + 95% BRAID 2.7dB@ 400MHz NC/DB/UV JKT ... .58/FT / .56/FT / .54/FT
9913 "EQUAL" SOLID BC CNTR FOIL + 95% BRAID 2.7 dB @ 400MHz UV JKT ... .42/FT / .40/FT / .38/FT
LMR 240 (8X SIZE) SOLID CNTR FOIL + BRAID 3.0dB @ 150MHz WP/UV JKT ... .43/FT / .42/FT / .41/FT
LMR 400 SOLID CCA CNTR FOIL + BRAID 2.7dB @ 450MHz WP/UV JKT ... .53/FT / .51/FT / .50/FT
LMR 400 "ULTRA-FLEX" STRD BC CNTR FOIL + BRAID 3.1dB @ 450 MHz TPE JKT ... .79/FT / .78/FT / .77/FT
LMR 600 (OD.590") SOLID CCA CNTR FOIL + BRAID 1.72dB @ 450 MHz WP/UV JKT ... 1.25/FT / 1.22/FT / 1.20/FT
LMR 1200 (OD 1.200") C.TUBE CNTR FOIL + BRAID 0.864dB @ 450MHz WP/UV JKT ... 4.73/FT / 4.71/FT / 4.69/FT
LDF4-50A 1/2" "ANDREWS HELIX" 1.51dB @ 450MHz ... 25FT/UP ... 2.10/FT
LDF5-50A 7/8" "ANDREWS HELIX" 0.834 @ 450MHz ... 25FT/UP ... 5.37/FT

COAX (50 OHM "HF" GROUP) — 100FT/UP / 500FT / 1000FT

RG213/U STRD BC MIL-SPEC NC/DB/UV JACKET 1.2 dB/1800WATTS @ 30MHz ... .36/FT / .34/FT / .32/FT
RG8/U STRD BC FOAM 95% BRAID UV RESISTANT JKT 0.9dB/1350WATTS @ 30MHz ... .32/FT / .30/FT / .28/FT
RG8 MINI(X)95% BRAID UV RESISTANT JACKET 2.0dB/875 WATTS @ 30MHz ... .15/FT / .13/FT / .12/FT
(RG8 MINI AVAILABLE IN THESE JACKET COLORS: BLK, WHT, CLR, or SILVER)
RG214/U STRD SC 2-95% SILVER BRAIDS NC/DB/UV JKT 1.2 dB/1800WATTS @ 30MHz ... 25FT/UP ... 1.75FT

COAX (50 OHM "TEFLON" GROUP)

RG142/U SOLID SCCS 2-95% SILVER BRAIDS TEFLON JKT 8.2dB/1100WATTS @ 400MHz ... 25FT/UP 1.25/FT
RG303/U SOLID SCCS 1-95% SILVER BRAID TEFLON JKT 8.6dB/1100WATTS @ 400MHz ... 25FT/UP 1.00/FT
RG316/U STRD SCCS 1-95% SILVER BRAID TEFLON JKT 21.0dB/210WATTS @ 400MHz ... 25FT/UP 0.45/FT
RG393/U STRD SC 2-95% SILVER BRAID TEFLON JKT 1.4dB/9500WATTS @ 50MHz ... 25FT/UP 4.00/FT

COAX (75 OHM GROUP) — 100FT/UP / 500FT / 1000FT

RG11A/U STRD BC (VP-66%) 95% BRAID NC/DB/UV JKT 1.3dB/1000WATTS ... .40/FT / .38/FT / .36/FT
RG11/U SOLID BC FOAM (VP-78%) 95% BRAID UV JKT 1.1dB/800WATTS ... .38/FT / .36/FT / .34/FT
RG6/U CATV FOAM 18GA CC8 FOIL + 60% ALUM BRAID ... .14/FT / .12/FT / .10/FT

LADDER LINE GROUP — 100FT/UP / 500FT / 1000FT

450 OHM 18GA SOLID CCS (POWER: FULL LEGAL LIMIT) ... .12/FT / .10/FT / .09/FT
"FLEXIBLE" 450 OHM 16GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT+) ... .18/FT / .17/FT / .16/FT
"FLEXIBLE" 450 OHM 14GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT++) ... .25/FT / .24/FT / .23/FT
300 OHM 20GA STRD (POWER: FULL LEGAL LIMIT) ... .15/FT / .13/FT / .12/FT

ROTOR & CONTROL CABLES — 100FT/UP / 500FT / 1000FT

5971 8/COND (2/18 6/22) BLK UV RES JKT. Recommended up to 125ft ... .20/FT / .18/FT / .16/FT
4090 8/COND (2/16 6/20) BLK UV RES JKT. Recommended up to 200ft ... .35/FT / .34/FT / .32/FT
1418 8/COND (2/14 6/18) BLK UV RES JKT. Recommended up to 300ft ... .47/FT / .45/FT / .43/FT
1216 8/COND (2/12 6/16) BLK UV RES JKT. Recommended up to 500ft ... .78/FT / .74/FT / .70/FT
18GA STRD 4/COND PVC JACKET ... .20/FT / .18/FT / .16/FT
18GA STRD 5/COND PVC JACKET ... .22/FT / .20/FT / .18/FT
18GA STRD 6/COND PVC JACKET ... .23/FT / .21/FT / .19/FT

ANTENNA WIRE (UNINSULATED BARE COPPER) — 100FT/UP / 500FT / 1000FT

14GA 168 STRD *"SUPERFLEX" (great for Quads & Portable set-ups etc.)* ... .12/FT / .10/FT / .08/FT
14GA 7 STRD *"HARD DRAWN" (perfect for permanent Dipoles etc.)* ... .08/FT / .07/FT / .06/FT
14GA SOLID *"COPPERWELD" (for long spans etc.)* ... .08/FT / .07/FT / .05/FT
14GA SOLID *"SOFT DRAWN" (for ground radials etc.)* ... .08/FT / .07/FT / .06/FT
3/16" DOUBLE BRAID *"DACRON"* ROPE 770# TEST WEATHERPROOF ... .12/FT / .09/FT / .08/FT

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50FT *"FLEXIBLE"* 9913 FOIL+95% BRAID 2.7dB @ 400MHz ... 35.00/EA
100FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5dB @ 50MHz ... 45.00/EA
50FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5 dB @ 50MHz ... 25.00/EA
100FT RG8/U FOAM 95% BRD UV RESISTANT JKT 1.2 dB @ 50MHz ... 40.00/EA
50FT RG8/U FOAM 95% BRD UV RESISTANT JKT 1.2dB @ 50MHz ... 22.50/EA
100FT RG8MINI(X) 95% BRD UV RES JKT 2.5dB @ 50MHz ... 21.00/EA

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10GA (rated:30 amps) ... 25FT $10.50 ... 50FT $19.00 ... 100FT $36.00
12GA (rated:20 amps) ... 25FT $8.00 ... 50FT $14.00 ... 100FT $26.00
14GA (rated:15 amps) ... 25FT $6.00 ... 50FT $10.00 ... 100FT $18.00

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1/2 INCH WIDE (equivalent to 10ga) ... 25FT $12.50 ... 50FT $24.00 ... 100FT $48.00

CONNECTORS

PL 259 SILVER/TEFLON/GOLD TIP ... 10PC $11.00 ... 25PC $25.00 ... 50PC $47.50 ... 100PC $90.00
"N" (2PC) SILVER TEFLON/GOLD TIP ... 10PC $32.50 ... 25PC $75.00 ... 50PC $143.75 ... 100PC $275.00

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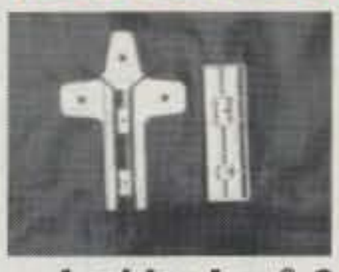

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SM3LIV	**14**	**40,348**	**200**	**154**
SM7AIL	"	6,480	65	60
SM3FJF	"	1,768	36	34
***SM5ARL**	**A**	**265,872**	**367**	**348**
*SM4AIO	"	203,775	434	275
*SM7ATL	"	151,410	306	245
*SM5BDA	"	64,980	181	171
*SM7HSP	"	39,621	163	141
*SM4/YO9FVU	"	25,530	132	115
***SM5DUT**	**14**	**40,650**	**173**	**150**
*SMØBDS	"	22,967	125	119
*SM6AHU	"	12,516	100	84
*SM6JOC	"	8,214	85	74
***SK4UW**	**3.7**	**5,824**	**60**	**52**
*SMØDZH	"	2,964	40	38

POLAND

SP9QMP	**A**	**1,076,649**	**1054**	**501**
SP6IXF	**A**	**1,001,220**	**867**	**492**
SP6AZT	**A**	**525,210**	**651**	**366**
SP2JMR	"	391,455	550	339
SQ6CWP	"	388,280	601	340
SP1CHV	"	339,939	502	321
SP9VEJ	"	75,012	212	188
SP3VAU	"	30,352	122	112
SP9LAS	"	15,879	88	79
SN2B	**21**	**4,027,706**	**2159**	**778**
		(Op: SP2FAX)		
SP7SEG	"	594	18	11
SP9EML	**14**	**7,670**	**70**	**65**
SP4AVG	"	5,768	65	56
SP9KAO	"	4,770	66	53
SP7GIQ	**7**	**2,654,768**	**1544**	**599**
SP6EII	**3.7**	**6,630**	**88**	**39**
***SP2QCH**	**A**	**479,100**	**778**	**300**
***SP5ELA**	**A**	**414,864**	**557**	**344**
***SP1AEN**	**A**	**296,522**	**424**	**346**
*SP6MLX	"	294,722	464	298
*SP5BB	"	234,048	408	318
*SP8OON	"	94,050	307	171
*SP7FQI	"	82,062	220	194
*SP5GKN	"	70,784	185	158
*SP4ILM	"	65,520	250	144
*SP1EOI	"	52,416	172	144
*SP9KJU	"	29,258	148	126
*SP3KRF	"	28,405	180	95
*SP1MVG	"	26,670	120	105
*SP9LDP	"	23,100	109	100
*SP4EEZ	"	19,019	87	77
*SP8TDE	"	12,852	72	68
*SP7LHX	"	9,882	104	55
*SP3KPN	"	9,660	92	68
*SP9RTF	"	6,144	99	32
*SP3TYF	"	3,861	68	33
*SP9MDY	"	2,343	35	33
***SP8HXN**	**14**	**48,510**	**206**	**154**
*SP2GNB	"	41,588	193	148
*SP5ICS	"	31,913	201	97
*SP2CYK	"	28,084	146	119
*3Z6AEF	"	17,391	129	187
*SP6DHH	"	15,744	126	96
*SP9IKN	"	8,904	105	53
*SP2AHD	"	5,665	55	55
*SP9KGG	"	3,706	64	34
*SP9EH	"	1,596	47	19
*SP7RFF	"	625	37	15
***SP8EEX**	**21**	**1,040**	**21**	**20**
***SP9CAY**	**7**	**46,018**	**148**	**133**
***SP5JTF**	**1.8**	**24,200**	**129**	**100**

GREECE

SV2BFN	**21**	**12,395**	**67**	**67**
SV2YC	"	12,000	71	60
J41DET	**14**	**173,628**	**534**	**273**
***SV1CIB**	**A**	**208,296**	**399**	**263**
***SV1CDN/3**	**14**	**73,332**	**355**	**188**
***SV2CWY**	**7**	**500,640**	**628**	**336**
***SV2AEL**	**3.7**	**283,860**	**448**	**285**

SAN MARINO

T77WI	**3.7**	**575,312**	**807**	**328**

BOSNIA

***T97V**	**7**	**271,392**	**447**	**264**
***T94ON**	**1.8**	**172,032**	**375**	**224**

TURKEY (EUROPE)

TA1BM	**A**	**8,142**	**61**	**46**

EUROPEAN RUSSIA

RN6BY	**A**	**3,020,010**	**2340**	**730**
RK4WWA	**A**	**1,143,320**	**1320**	**505**
		(Op: UA4WA)		
UA4HEJ	"	536,920	847	433
RU6BV	"	193,680	445	269
U1BA	"	56,496	238	176
RU4HY	"	29,150	118	106
UA3BZ	"	26,973	120	111
RV3DSD	"	22,140	119	90
RV6ASY	"	20,696	123	104
UA6MZ	**21**	**125,967**	**410**	**211**
RU4AA	**14**	**1,407,133**	**1417**	**611**
UA6NZ	**14**	**1,229,505**	**1337**	**484**
UA1CKC	"	394,048	605	376
UA1OMZ	"	373,042	629	383
UA3PP	"	197,775	405	293
UA1OMS	**7**	**194,580**	**328**	**235**
UA4CJJ	**3.7**	**173,072**	**356**	**232**
UA1OZ	"	80,500	224	175
RV1CC	**1.8**	**59,202**	**202**	**143**
***RA3WA**	**A**	**867,732**	**932**	**501**
***UA1OMX**	**A**	**240,279**	**456**	**303**
*RU4WE	"	147,275	363	215
*RW4AO	"	7,866	82	69
***UA4LCQ**	**21**	**240,267**	**524**	**283**
*RV6APN	"	425	25	25
***UA3ABJ**	**14**	**433,024**	**803**	**398**
***RA3DUT**	**14**	**379,857**	**611**	**381**
*UA1ZKZ	"	173,922	478	303
*RA4PQC	"	55,014	224	173
***RA4HUQ**	**7**	**238,140**	**405**	**270**
*RW1CW	"	152,680	312	220
*UA1OSS	"	1,080	21	18
***RA4NW**	**1.8**	**34,410**	**148**	**111**
*UA6JVP	"	13,904	92	79

KALININGRAD

UA2FJ	**3.7**	**1,323,168**	**1255**	**462**

UKRAINE

URØD	**A**	**3,044,062**	**1923**	**721**
		(Op: UT7DX)		
UT5UGR	**A**	**3,019,072**	**2221**	**736**
US1E	**A**	**1,725,976**	**1841**	**518**
UUØJZ	"	1,562,325	1730	563
UX1UA	"	605,485	766	415
UR7R	"	334,636	556	311
UR5EPV	"	55,680	210	160
UX1HV	"	20,172	160	86
UXØHA	**21**	**31,598**	**173**	**122**
UT7LA	"	7,018	65	58
US5WE	**14**	**2,557,029**	**1751**	**677**
US6UN	**14**	**1,221,729**	**925**	**449**
UTØU	"	1,141,755	1401	515
		(Op: UT5UDX)		
UX4UM	"	884,291	1112	491
UT3QW	"	165,636	534	258
UT8I	"	122,130	383	230
		(Op: UT8IM)		
UY5TE	"	76,224	284	192
UR7E	**7**	**1,396,229**	**997**	**487**
		(Op: UR5EDU)		
UT3C	"	782,890	705	395
		(Op: UT7CR)		
UT3UZ	**3.7**	**612,000**	**762**	**375**
EN1I	**3.7**	**582,540**	**772**	**365**
		(Op: US1ITU)		
UY5ZZ	"	492,576	730	336
UX2VZ	"	304,700	507	277
UX1VT	"	69,660	199	162
UT4EK	"	23,719	124	104
EN6Q	**1.8**	**47,472**	**186**	**138**
		(Op: UT7QF)		
***UT1ZZ**	**A**	**338,826**	**594**	**298**
***UX3M**	**A**	**173,070**	**386**	**230**
*UX5EF	"	87,875	279	185
*US5ZE	"	35,882	195	77
*UR5UW	"	19,836	100	87
*UR5EDO	"	6,490	58	55
***UR5QRB**	**21**	**4,850**	**70**	**50**
***US4LAD**	**14**	**1,441,196**	**1315**	**508**
*UX1L	"	248,184	550	324
		(Op: UX1LA)		
*US8IM	"	36,432	195	144
***UR7TZ**	**7**	**223,938**	**381**	**261**
***UX3MO**	**7**	**223,648**	**353**	**241**
*US7IGF	"	182,700	313	225
*UR8QR	"	170,344	301	214
*UR4FWI	"	4,048	49	44
***UT1WW**	**1.8**	**20,972**	**120**	**98**
*UR5FCM	"	4,992	60	52

LATVIA

YL2KO	**A**	**917,472**	**977**	**456**
YL2SW	"	300,000	538	300
YL1ZD	"	24,428	247	207
		(Op: YL3GBC)		
YL2GN	**7**	**419,850**	**519**	**311**
***YL2KA**	**A**	**1,023,309**	**1189**	**439**
***YL2EC**	**14**	**17,363**	**107**	**97**
***YL2GTS**	**1.8**	**4,876**	**53**	**46**

ROMANIA

YO3GHC	**A**	**349,060**	**614**	**310**
YO8FR	**A**	**188,573**	**420**	**341**
YO3RU	"	150,336	353	232
*YO2BOF	"	243,567	444	291
*YO9XC	"	17,658	155	130
***YO3AIL**	**21**	**14,697**	**87**	**69**
***YO3JF**	**14**	**471,776**	**780**	**368**
*YO2KJO	"	278,880	335	280
*YO9FEH	"	6,968	87	67

YUGOSLAVIA

4NØAV	**A**	**4,720,330**	**2364**	**794**
		(Op: YU7AV)		
YT1BB	**A**	**4,605,106**	**2502**	**874**
YU7BW	**A**	**2,652,762**	**1798**	**686**
YU7SF	"	37,152	163	129
YT7A	**7**	**2,556,684**	**1323**	**607**
		(Op: 4N7DW)		
YTØT	**7**	**1,535,616**	**1144**	**496**
		(Op: YU1YV)		
YT6A	**3.7**	**1,976,436**	**1241**	**558**
YZ1U	**3.7**	**1,066,912**	**963**	**433**
YU1ZZ	**1.8**	**346,326**	**549**	**293**
***YU1KR**	**28**	**121**	**13**	**11**
***YU1ADO**	**14**	**154,240**	**402**	**241**
***YU1BX**	**1.8**	**24,156**	**117**	**99**

ALBANIA

ZA1AJ	**14**	**2,055,456**	**2027**	**624**
		(Op: OK2ZV)		

MACEDONIA

***Z3ØM**	**A**	**2,207,672**	**1805**	**652**
		(Op: Z31GX)		
*Z32KV	"	154,432	440	254
***Z31GB**	**7**	**270,830**	**380**	**265**

OCEANIA

PHILIPPINES

4H9RG	**A**	**3,160,792**	**1925**	**536**
DX1RPI	**A**	**145,885**	**294**	**179**
***WD5AAH/DU5**	**A**	**65,461**	**167**	**121**
*DU1LER	"	29,049	143	69
***DU1COO**	**14**	**169,422**	**324**	**187**

FRENCH POLYNESIA

***FO5IW**	**A**	**3,933,336**	**2328**	**564**

HAWAII

WR6R/WH7	**A**	**11,258,410**	**3884**	**815**
WH6CQH	**14**	**2,698,162**	**1666**	**562**
N6VI/KH6	**7**	**2,831,532**	**1146**	**418**

AMERICAN SAMOA

AH8A	**21**	**4,165,080**	**2484**	**569**

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SAIPAN

***WHØAAV**	**A**	**604,420**	**918**	**235**
KHØ/JM4HNS	"	332,260	761	148

PAPUA NEW GUINEA

***P29MO**	**A**	**1,403,231**	**1160**	**416**

AUSTRALIA

VK5GN	**A**	**2,940,820**	**1592**	**545**
VK8HZ	**A**	**1,154,304**	**1143**	**334**
VK4MV	**28**	**4,774**	**54**	**31**
VK3DXI	**14**	**1,043,400**	**835**	**444**
VK2ARJ	**14**	**398,880**	**537**	**277**
VK4EET	**7**	**8,800**	**47**	**44**
***VK2VM**	**A**	**336,514**	**462**	**226**
*VK2AYD	"	221,076	370	207
***VK3NDS**	**21**	**159,030**	**320**	**171**
***VK2APK**	**14**	**317,520**	**416**	**280**

INDONESIA

YB2PBX	**A**	**1,612,760**	**1070**	**460**
***YB6INU**	**A**	**784,220**	**704**	**347**
***YB3OSE**	**A**	**606,771**	**705**	**297**
*YCØLOW	"	3,036	24	23
***YC6PUP**	**21**	**60,636**	**182**	**124**

NIUE

ZK2ZE	**A**	**581,108**	**434**	**281**

NEW ZEALAND

ZL6CC	**A**	**2,008,190**	**1380**	**491**
		(Op: ZL2TT)		
ZL1AXB	**28**	**49,941**	**186**	**93**

MARITIME MOBILE (ZONE 31)

YL3IZ/MM	**A**	**1,402,968**	**1043**	**392**

SOUTH AMERICA

CHILE

XR4B	**21**	**565,432**	**603**	**322**
		(Op: CE4ETZ)		
CE5CNT	"	236,966	404	218
CE3HJB	**7**	**337,600**	**303**	**211**
CE8EIO	**3.7**	**31,376**	**84**	**74**
***CE5BPE**	**A**	**2,720**	**38**	**34**
***CE2EZE**	**21**	**436,968**	**480**	**306**
*CE6NES	"	307,398	407	273

BOLIVIA

CP6AA	**A**	**3,445,930**	**1787**	**677**
		(Op: OHØXX)		

URUGUAY

CW6V	**21**	**6,238,998**	**2560**	**837**
CX7CC	**21**	**19,530**	**100**	**90**
CW7B	**14**	**1,383,858**	**882**	**523**
CW1T	**7**	**222,912**	**239**	**127**
		(Op: CX2TL)		
***CX8CP**	**28**	**131,217**	**478**	**229**

ECUADOR

HC2GT	**A**	**1,926,615**	**1245**	**515**
HD2RG	**14**	**1,694,016**	**1088**	**544**
***HC1WW**	**A**	**8,140**	**64**	**55**
***HC1NCN**	**7**	**108,580**	**156**	**122**

COLOMBIA

HK3SGP	**A**	**36,273**	**139**	**107**
HK3LT	"	20,412	95	84

ARGENTINA

LU7DW	**A**	**4,261,799**	**1988**	**709**
LU2BAR	**A**	**557,200**	**565**	**350**
LU4HAW	**28**	**606,816**	**767**	**288**
		(Op: LU3HIP)		
LU7MAX	**21**	**18,924**	**88**	**83**
AY1I	**7**	**3,289,652**	**1060**	**554**
		(Op: LU1IV)		
LT1F	**7**	**1,456,760**	**669**	**395**
		(Op: LU1FKR)		
LU4D	"	704,104	450	283
LU8VCC	"	260,130	253	195
***LU2NI**	**A**	**2,827,360**	**1506**	**656**
***L44D**	**A**	**1,404,557**	**1015**	**493**
		(Op: LU4DFH)		
***LU5E**	**A**	**1,095,590**	**875**	**445**
*LU4HKN	"	3,825	58	45
***LU3HWE**	**28**	**309,657**	**497**	**233**
***LU9HZS**	**28**	**281,750**	**471**	**230**
*LU3FZW	"	271,040	463	220
*LU4FCZ	"	166,004	347	188
*LU5HWR	"	93,808	255	143
*LW2DBM	"	90,750	238	165
*LU1FNH	"	72,660	212	140
*LU3HL	"	61,750	199	125
*LU6MFD	"	58,410	355	165
*LW7EGO	"	49,569	182	123
*LU6APW	"	40,232	149	107
*LW8EXF	"	2,301	53	39
***LU8FOZ**	**21**	**1,694,420**	**1087**	**532**
***LU2DW**	**21**	**1,540,768**	**995**	**541**
***LU1HTF**	**21**	**1,087,124**	**826**	**463**
*LU3HEO	"	1,011,780	776	462
*LW2EOC	"	324,615	406	285
***LU5FCI**	**14**	**1,448,500**	**1010**	**500**
***LU1ICX**	**14**	**1,182,275**	**875**	**475**
*LW1ECO	7	24	6	6

PERU

OA4EI	**A**	**201,020**	**375**	**230**

ARUBA

P4ØV	**A**	**11,141,648**	**3747**	**868**
			(Op: AI6V)	
P4ØA	**3.7**	**1,715,076**	**699**	**426**
			(Op: VE3BMV)	

NETHERLANDS ANTILLES

PJ9Y	**A**	**10,099,584**	**3452**	**792**
			(Op: OH6XY)	

BRAZIL

PW2A	**A**	**658,860**	**622**	**395**
			(Op: PT2BW)	
PY1CAS	"	27,180	115	90
ZX2WPX	**28**	**33,075**	**168**	**105**
PU1OCN	"	4,888	65	47
PU2TDU	"	3,827	52	43
ZX5J	**21**	**8,632,268**	**3179**	**929**
			(Op: PP5JR)	
PW4Y	**21**	**5,611,370**	**2436**	**790**
			(Op: PY4OY)	
PY3BD	"	262,560	380	240
ZY2HT	**7**	**949,440**	**547**	**345**
			(Op: PU2LSR)	
PY2FUP	"	99,320	142	130
***PY2APQ**	**A**	**273,500**	**415**	**250**
*PU2YZP	"	27,056	150	89
*ZY1TIA	"	12,936	107	76
*PY2XW	"	3,330	38	37
***PU2MHB**	**28**	**110,400**	**291**	**150**
***ZV5E**	**28**	**101,736**	**267**	**157**
*ZW5W	"	77,552	236	148
		(Op: PP5WN)		
*PU2MRY	"	42,957	175	111
*ZV2WZV	"	32,136	165	103
*PU2MTS	"	13,516	104	62
*PY2OZF	"	8,154	89	54
***PP5UA**	**21**	**2,715,072**	**1478**	**632**
***PT2AW**	**14**	**95,424**	**223**	**168**
*PT5M	"	12,744	81	72
*PT7SD	"	3,069	33	33

VENEZUELA

YV5NKV	**21**	**195,597**	**343**	**211**
YW1A	**14**	**3,791,009**	**1908**	**673**
			(Op: YV1AVO)	
YV4YC	"	428,640	506	304
YV4FRS	"	324,142	411	274
YV3BC	"	24,882	100	87
YV4FZM	**3.7**	**332,280**	**291**	**195**
YV2IF	**1.8**	**16,758**	**61**	**49**
***YV6DBX**	**A**	**33,108**	**104**	**89**
***YV5NWG**	**21**	**252,486**	**543**	**169**
*YV6DBW	"	17,600	102	80
***YV5NCK**	**7**	**256,896**	**234**	**192**

PARAGUAY

ZPØZ	**28**	**209,600**	**411**	**200**
ZPØM	**21**	**4,066,838**	**1945**	**727**
			(Op: ZP5XF)	
ZP5MAL	**21**	**3,917,200**	**1928**	**700**
ZP5SAT	**7**	**4,216**	**41**	**34**

SINGLE OPERATOR ASSISTED

UNITED STATES

WAØPUJ	**A**	**2,055,456**	**1337**	**702**
KF8UM	**A**	**1,526,460**	**1033**	**570**
KBØWY	"	1,024,212	841	534
K3SW	**A**	**642,470**	**617**	**410**
KCØZC	"	588,720	735	440
N1NQD	**A**	**571,725**	**512**	**363**
N6CCL	**A**	**502,944**	**642**	**403**
KA7ZUM	**A**	**415,905**	**551**	**357**
N8BJQ	"	412,192	500	352
K2LE	**A**	**373,842**	**448**	**322**
K3IXD	"	292,152	407	296
KF6AYQ	"	253,750	400	290
WB2KDD	"	242,060	331	260
N1OPZ	"	195,674	291	227
W3HVQ	"	154,448	267	196
KD8FS	"	140,697	238	193
AD4PU	**A**	**128,232**	**334**	**234**
KZ2A	"	80,550	202	179
NG8D	"	80,524	204	164
WB5B	**A**	**79,707**	**200**	**163**
N2VW	"	41,124	175	138
KD1GG	"	33,930	104	90
K3WW	"	25,668	110	93
NI6T	"	24,549	238	147
N2FF	"	12,200	69	61
N1KWJ	"	8,300	55	50
K9OSH	**14**	**1,122**	**22**	**22**

LOW POWER

ND8L	**A**	**171,360**	**294**	**224**
KD4BK	**A**	**119,380**	**252**	**188**
WA2ZGO	**A**	**99,134**	**223**	**194**
AB7CZ	**A**	**28,427**	**154**	**131**

DX

UU5J	**A**	**6,621,225**	**3180**	**975**
SØ7NY	**A**	**5,933,645**	**2751**	**655**
			(Op: EA3NY)	
SKØWJ	**A**	**1,738,692**	**1477**	**612**
			(Op: SMØTHN)	
S59AA	**A**	**1,248,628**	**1023**	**541**
S57W	"	1,114,648	959	503
IK2HKT	**A**	**1,001,988**	**1025**	**468**
YO3FRI	**A**	**601,152**	**799**	**404**
DL5IC	**A**	**527,079**	**588**	**399**
EA5YJ	**A**	**182,178**	**363**	**261**
EA1BOI	"	167,253	370	283
EA7DPU	"	129,712	322	242
DK3GI	"	58,400	180	160
SO5TW	**A**	**34,892**	**150**	**122**
EA7GGP	"	2,590	35	35
JAØBMS/1	**21**	**25,864**	**122**	**106**
S54ZZ	**14**	**1,440,306**	**1200**	**483**
ON4DPP	**14**	**1,131,612**	**1009**	**521**
DL7IO	**14**	**1,030,778**	**911**	**497**
OK1DIG	**14**	**1,006,604**	**900**	**524**
OI3NXW	**14**	**752,124**	**976**	**466**
IQ6I	**14**	**293,284**	**636**	**323**
			(Op: IK6CAC)	
JA9XBW	**14**	**59,631**	**165**	**139**
JK1OXU	"	10,030	66	59

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	N F-F #50403 - X	$42.95 ea.
IN-Door Use!	UHF(SO-239) M-F #20207 - X	$39.95 ea.
	N M-F #20310 - X	$42.95 ea.
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(Picture: N M-F #20310-X)

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IO2A	7	540,960	661	336
		(Op: IK2RZP)		
DL5FDA	3.7	622,728	822	372
IN3ASW	3.7	517,992	755	339
EA1DVY	1.8	6,400	60	50

LOW POWER

JF1SEK	A	793,324	707	406
OK2BEE	A	201,481	421	269
JK2VOC	*	190,390	368	241
S5ØU	A	172,200	377	246
VC3TA	A	147,312	252	216
JK1GKG	A	97,675	210	145
PY2PAH	14	50,806	148	133
JH7QXJ	14	25,745	112	95
DKØIU	7	43,420	147	130
		(Op: DJ6TK)		

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UNITED STATES

KI1G	5,737,375	2223	875
WE9V	5,362,680	2412	920
KT8X	3,881,241	2024	819
NE8T	3,723,785	1931	767
W5KFT	3,661,928	2500	794
K1KP	3,175,935	1695	735
WU7Q	3,100,902	1766	714
KC7V	2,629,989	1900	711
KF9PL	2,137,240	1509	680
NCØP	2,089,044	1456	667
WY3T	2,085,042	1513	667
NE3F	2,080,764	1412	644
KQ4HC	2,062,011	1400	659
KZ6X	2,040,108	1801	652
NX3Y	2,000,241	1176	621
K3MD	1,843,776	1102	582
KI7WX	1,525,667	1370	611
K5XI	1,524,936	1309	609
KRØB	1,402,259	1166	599
NE2W	1,369,115	1111	605
WG1N	1,011,500	958	500
N5OZB	966,216	949	508
WA6TKV	713,371	1016	493
NV7J	707,161	742	409
WA7IIM	552,024	575	374
KC1F	443,520	492	315
AC5CT	401,080	664	370
KC5RMW	301,124	575	332
KR4ND	272,874	396	267
AA2VN	184,552	338	236
KC5I	163,344	386	249
KB2HZ	160,916	250	196
KMØR	84,868	288	196
W1BK	12,040	74	70

NORTH AMERICA

VP2E	11,365,590	3938	914
WP4U	11,308,155	3721	955
TO5T	7,049,145	3025	807
VE6SV	6,033,529	2708	821
VC3SK	5,978,544	2370	804
CY2A	5,125,335	2124	761
VD9WH	4,333,880	2012	711
VE3RM	4,285,475	1901	725
CH6FI	3,841,282	2099	643
VD6AO	1,674,842	1330	481
VE5SF	753,496	808	388

AFRICA

CQ3B	4,415,738	2025	631

ASIA

TA2II	7,619,980	2669	695
RK9CWW	4,480,980	1808	681
JG2ZQZ	3,900,874	1834	677
YM3DL	3,539,740	2066	493
EX9A	3,144,336	1826	624
JE6ZIH	2,827,568	1418	632
RW9OWD	2,368,728	1161	501
E22AAB	1,482,976	1575	484
RK9CWY	918,681	665	359
JT1JA	674,900	1035	340
VU2PAI	604,776	643	339
JA1YXP	350,900	377	242
BY2HIT	136,367	476	161
RK9FZW	34,608	206	168

EUROPE

IR4T	10,134,075	3530	995
TM1C	10,099,496	3668	946
LZ5W	9,255,480	3375	1047
TK1A	9,153,720	3578	940
CT8T	7,308,004	3587	902
RU3A	6,931,815	3237	977
OEM2S	6,817,482	3022	887
DJ6QT	5,814,450	2405	885
OH2IW	5,759,190	2714	890
IQ4T	5,573,800	2450	775
9A7A	5,481,870	2661	870
OI1W	5,451,936	2879	854
RW2F	5,160,600	2531	846
OI8LQ	5,069,682	2771	842
DF7RX	4,969,484	2458	842
HG3O	4,852,750	2640	826
RU6LWZ	4,704,783	2633	843
IO5A	4,660,972	2268	827
RU1A	4,651,200	2763	855
TP1ØCE	4,447,492	2641	772
GXØWPX	4,442,088	2396	822
EA3ATM	4,391,532	2166	796
ED5WPX	4,338,216	2519	801
OH1EH	4,262,478	2504	786
LZ9A	4,193,970	2177	781
TM8FL	4,101,616	1497	659
ED3DX	4,082,549	2313	817
GW8GT	4,044,457	2261	811
OM7M	3,792,054	2084	799
OM3A	3,685,704	2031	759
OH1AA	3,486,462	2077	771
EA3CWK	3,410,082	2003	741
TM2X	3,248,287	2117	757
IQ9K	2,997,360	2309	690
LY6M	2,836,295	1916	695
II2K	2,823,156	1692	714
ON6BR	2,815,800	1838	722
IQ7A	2,767,672	2094	694
ON5LL	2,735,004	1775	708
TM6T	2,708,682	1752	694
LY3MR	2,661,186	1929	671
SM2HWG	2,650,234	1892	719
IU2D	2,630,478	1624	697
II3R	2,258,472	1523	677
OZ5BAL/P	2,120,920	1456	680
ED1K	2,100,480	1660	640
TM5Z	2,051,280	1713	616
TF3D	1,999,242	2300	602
SN6O	1,946,790	1521	582
DLØUM	1,806,650	1269	575
UT7L	1,688,632	1381	619
IU9C	1,683,714	1714	578
RU4L	1,667,430	1647	573
IO2L	1,632,612	1262	604
S57CM	1,608,810	1374	489
EA3RKG	1,571,220	1284	609
SP9PRO	1,564,695	1355	545
EA4RCU	1,510,290	1147	582
YZ7A	1,454,750	1278	550
GW3CSA	1,423,976	1191	568
TMØPX	1,417,590	1363	570
OL5T	1,328,943	1285	523
DK4QT	1,327,482	1130	558
DL3QQ	1,293,256	1215	556
OK2KOD	1,155,986	1001	514
OL2A	1,118,376	1008	504
EU5F	1,109,250	1450	510
DL3KZA	1,087,000	1072	500
IU1L	981,350	1109	475
UR4E	979,032	1190	456
DAØXX	973,632	993	461
S59DKR	945,684	1091	436
IT9AJP	943,110	1033	499
OT6R	846,384	910	462
EA1URG	839,826	866	481
RX3RXX	799,596	1596	501
OK1KZD	757,368	501	314
CS4Z	612,745	666	427
CSØRCL	521,656	851	394
DLØSKZ	514,564	666	394
EA5FUF	508,260	731	394
SN5W	503,487	688	387
OK7DX	441,485	624	349
YT7P	412,518	597	349
RK3QWM	374,574	666	326
PI4CC	366,633	555	333
IK7EZP	363,650	544	350
OI1AB	351,870	557	317
LA1H	335,160	507	342
OH2NRG	324,982	503	334
YU1L	315,117	575	297
YO2KJO	278,880	335	280
DFØRG	277,856	487	304
OZ5EDR	246,816	446	288
YO5KAW/P	226,180	428	263
OM3KHU	195,563	405	269
LA1VFA	174,635	400	265
ED2WP	167,254	362	241
OM3RDP	158,155	398	235
IK4ZIT	126,260	274	214
EA3BT	124,623	287	227
LY2BN	94,359	262	213
SK6NP	63,520	217	160
R3ARES	96	9	8

OCEANIA

VK4MZ	3,805,206	1781	551
VS6WO	3,740,730	2741	658
FK5DX	3,508,758	2010	594
VK1DX	2,959,530	1781	510
YBØZCE	2,210,145	1553	485
KB3TS/NH6	1,802,274	1224	417
VK6ANC	1,596,718	1196	454
4G1A	841,074	920	246
DX3H	536,750	737	250
K6GSS/AH7	8,869	61	49

SOUTH AMERICA

ZXØF	23,896,640	6123	1060
HC8A	21,830,848	5717	988
XR8S	7,675,670	2675	815
LU4AA	4,695,680	2209	736
ZZ5E	3,954,410	1914	730
LU1HPW	3,945,650	1804	730
LU8DZE	2,547,666	1483	594
LU1NF	861,568	784	424
YV3IUP	825,858	547	291
LU4DRC	528,660	555	356
LU1UM	50,140	162	115

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

WZ1R	11,214,770	3913	1061
WT1S	10,656,380	3642	1030
WM2C	8,958,978	3861	959
NE9U	2,719,500	1872	750
AB4JI	1,628,946	1251	627
KF9YT	852,150	794	494

NORTH AMERICA

KP4XS	19,590,387	6167	1083
VD6JY	7,919,121	3149	859
CK7PG	7,213,942	3150	818
NP4Z	6,434,208	2823	792
VD5RI	3,810,870	2410	630

ASIA

JO1YAO	613,536	611	308

EUROPE

9A1A	19,204,080	6304	1176
OT6A	18,190,766	6277	1166
PA6WPX	10,685,010	4387	1022
EM2I	10,076,904	4963	1038
EA3FP	6,144,045	2909	905
LY7A	5,596,304	3379	812
SV1DKR	960,687	1502	459
YO8KUB	795,150	538	310
ED7WPX	597,198	740	413

Disqualified: LU4FM for excessive unverifiable calls.

CHECK LOGS

The following logs were used for cross-checking. Check logs and SWL logs are always appreciated.

3A2MD, 9A3MA, AKØW, CP6UH, CS8EGW, CT1AGS, DL1ASF, DL1HSH, DL2AL, DL3MG, DL4VBS, DL5JRA, DL6LE, DL7UHD, DL8AXJ, EA1AAA, EA1ATL, EA1AUT, EA1CO, EA1CZF, EA1FFC, EA1OB, EA2AGB, EA2JZ, EA3AFW, EA3ATN, EA3FBO, EA3FYO, EA3GDX, EA4AUO, EA4FW, EA5BX, EA5BZS, EA5CGU, EA5DIT, EA5EI, EA5EIL, EA5GMA, EA5OL, EC1AMR, EC1ANC, EC5CXI, ED2AKP, EU2MM, F5GEG, F5JBF/P, HP1XZQ, IKØJMS, IK1ZFP, IK4ZHL, IV3BKH, JA1POS, KC7PLZ, KX7J, LA2XIA, LA3KJA, LA4OGA, LA7MJA, LA8LA, LA9VGA, LU3HBO, LU3VAO, LZ1DM, LZ1GU, LZ2PS, LZ2UZ, LZ2VP, LZ3AB, LZ4HI, NØXCF, NQ9M, OH2BPM, OH2KQ, OH3JR, OH5NE, OH5WL, OH8LBR, OK2OED, OK2PCN, OM2SM, OZ1LNZ, PAØTV, PA3EXI, PA3FYE, PI4FRM, PJ9/K8NI, PU2YZP, PU3WPA, PY3FBI, RA6LVT, RA9UKO, RK9AWQ, RK9JWZ, S51NM, SMØCSX, SM2KAL, SM3MHD, SM4SET, SM5ENX, SP1GZT, SP2LNY, SP2ZCD, SP3MGP, SP4AS, SP4CGJ, SP4CMW, SP4DZT, SP4HKB, SP4SAF, SP4WRF, SP6CES, SP6FJ, SP6NVK, SP7GAQ, SP9AVZ, SP9DTH, SP9LKS, SP9MAT, SP9RPW, SP9RPY, SPL-2ØØ189, SV1DNW, SV5DZX, UA3WCN, UA6JY, UA9OS, UR4QZF, US5EVD, UT3UZ, UT4UWC, VC3TEE, VE3BR, W1EWN, W7LQU, W9LT, WDØGQA, XE2MXZ, YC6HPO, YC9WGA, YL1ZF, YL2IP, YL2PJ, YL3BZ, YO6UO, YO8CRU, ZW5CIA.

CQ World-Wide WPX SSB Contest All-Time Records

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. Data following the calls: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

SINGLE OPERATOR

1.8	S52CD('95)	422,532	291
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	TE1C('95)	7,281,630	745
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZW5B('92)	13,006,917	959
AB	HC8A('92)	24,809,300	1060
QRP/p	HC8A('94)	7,520,562	714

MULTI-OPERATOR SINGLE TRANSMITTER

HC8A('93)	32,502,677	1107

MULTI-OPERATOR MULTI-TRANSMITTER

ED8ACH('91)	47,278,236	1319

CLUB RECORD

Northern California Contest Club('92)	97,527,906

U.S.A. RECORD HOLDERS

SINGLE OPERATOR

1.8	K1ZM('95)	327,712	308
3.5	WE3C('95)	1,519,300	475
7.0	KC7EM('95)	1,950,228	495
14	KC1XX('95)	4,787,328	832
21	WN4KKN/6('92)	4,538,050	814
28	WM5G('89)	4,213,127	799
AB	KM1H('92)	7,854,840	945
QRPp	KR2Q('92)	1,269,960	557

MULTI-OPERATOR SINGLE TRANSMITTER

WC4E('92)	11,611,929	1113

MULTI-OPERATOR MULTI-TRANSMITTER

WZ6Z('89)	18,737,170	1138

QRPp RECORD

HC8A('94)	7,520,562

WPX (Prefix) RECORD

HG73DX('91)	1,337

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	OH1RY/CT3('87)	290,140	163
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	EA8AH('96)	7,101,380	715
14	EA8AH('94)	8,194,536	852
21	TR1G('90)	6,788,925	825
28	FR5DX('91)	7,543,818	831
AB	ZD8Z('94)	18,118,880	992

ASIA

1.8	UL7ACI('91)	331,008	128
3.5	UA9CSS('94)	1,074,780	315
7.0	H24LP('87)	5,348,975	503
14	H2A('91)	6,297,464	758
21	7L1GVE('92)	6,848,136	838
28	JH1AJT('89)	4,848,480	740
AB	7Z2AB('92)	9,177,296	809

EUROPE

1.8	S52CD('95)	422,532	144
3.5	YT6A('96)	1,976,436	558
7.0	S5ØA('95)	4,536,756	714
14	IU9S('94)	5,677,177	869
21	CT2A('92)	6,029,559	919
28	9H1EL('89)	5,882,825	787
AB	YZ9A('91)	8,518,112	928

MULTI-OPERATOR SINGLE TRANSMITTER

AF	EA8BR('94)	15,311,851	953
AS	TA5/NØFYR('91)	16,474,965	1005
EU	IJ4R('91)	16,027,956	1146
NA	VP2EC('92)	24,409,580	1115
OC	P2ØX('93)	13,440,570	858
SA	HC8A('93)	32,502,677	1107

NORTH AMERICA

1.8	K1ZM('95)	327,712	308
3.5	TE1C('96)	2,161,568	496
7.0	TE1C('95)	7,281,630	745
14	KP2A('95)	7,088,976	912
21	FG5R('89)	9,936,240	912
28	J68AX('92)	4,709,985	651
AB	KP2A('93)	16,694,570	1006

OCEANIA

1.8	T32AF('83)	16,872	37
3.5	N6VI/KH6('94)	1,016,652	273
7.0	T32AF('93)	3,995,928	437
14	KG6DX('90)	4,558,527	733
21	AHØK('92)	7,206,850	698
28	P2ØA('92)	5,184,625	703
AB	WR6R/WH7('96)	11,258,410	815

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	P4ØA('96)	1,715,076	426
7.0	YV5A('95)	4,581,048	579
14	PYØFM('95)	9,660,432	939
21	ZW5B('95)	14,095,142	1054
28	ZW5B('92)	13,006,917	959
AB	HC8A('92)	24,809,300	1060

MULTI-OPERATOR MULTI-TRANSMITTER

AF	ED8ACH('91)	47,278,236	1319
AS	VS6WO('94)	16,555,040	967
EU	HG73DX('91)	30,664,095	1337
NA	VP2EC('94)	39,530,455	1285
OC	FKØAW('89)	26,538,972	1002
SA	ZZ5EG('87)	38,096,250	1250

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County, Florida. For more information, call Dave Millard at 407-288-7100. (Exams, registration at 8:30 AM.)

March 22, **Elizabethtown Hamfest**, Pritchard Community Center, Elizabethtown, Kentucky. For more information, contact Harold Bennett at 502-351-9599 (e-mail <ke4zev@juno.com>); or e-mail Bill Grieb at <w4bej@ecc-uky.campus.mci.net>; or send SASE to LTARC, P.O. Box 342, Vine Grove, KY 40175. (Exams; preregister with Rick Tinsley, 502-352-2361.)

March 23, **Delaware Valley Radio Association Hamfest**, Tall Cedars of Lebanon Picnic Grove, Trenton, New Jersey. Contact Hamcomp '97, P.O. Box 7024, West Trenton, NJ 08628 (609-882-2240).

March 23, **LAMARSFEST '97**, Lake County Fairgrounds, Grayslake, Illinois. For more information contact LAMARSFEST 97, 650 Green Bay Rd., Lake Bluff, IL 60044, or call Frank Avellone, W9GLO, at 847-234-4124 before 10 PM. (Exams.)

March 23, **WECAFEST '97**, Yonkers Raceway, Yonkers, New York. For information, call Thomas Raffaelli, WB2NHC, at WECA InfoLine 914-741-6606. (Exams.)

March 23, **LCARA 19th Annual Hamfest**, Madison High School, Madison, Ohio. For more information, call Roxanne at 216-256-0320. (Exams.)

March 29, **IRS Hudson NH Flea Market**, Hudson Lions Club, Hudson, New Hampshire. For more information, contact John, KA1FYB, 1 Paget Drive, Hudson, NH 03051; phone 603-881-5796; fax 603-598-0181; or e-mail <brunelle@tiac.net>.

March 29, **MTARS Annual Hamfest,** National Guard Armory, Tullahoma, Tennessee. Contact Ian Haynes, AB4SW, at 615-649-5187; fax 615-649-2941; or e-mail <ithaynes@edge.net>.

March 29, **Michigan City Hamfest and Computer Flea Market**, Michigan City High School, Michigan City, Indiana. For more information, contact Ron Stahoviak, N9TPC, 5802 N. 400 W., La Porte, IN 46350 (219-325-9089).

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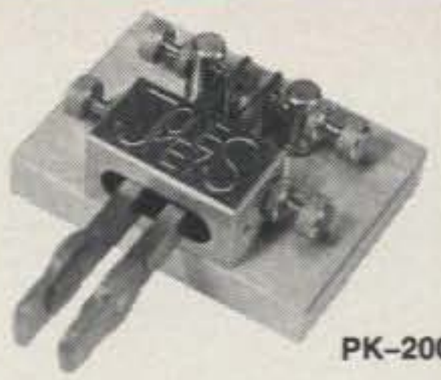

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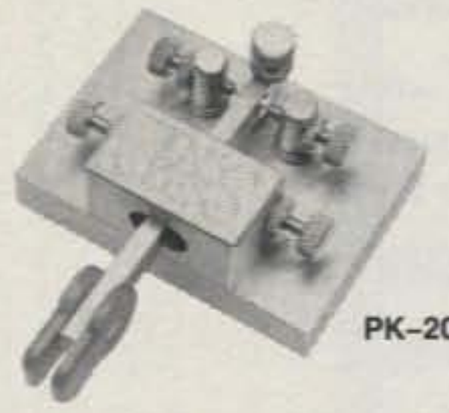

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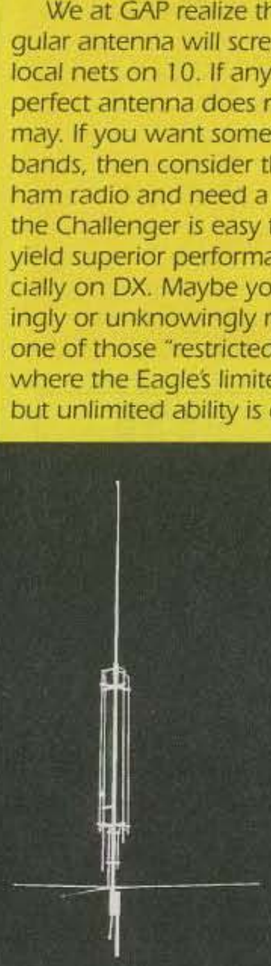

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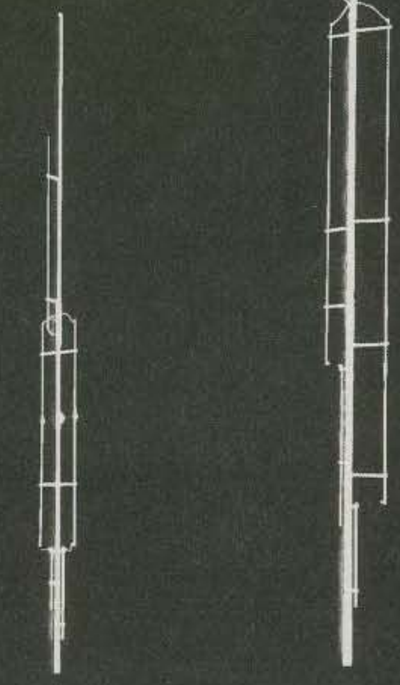

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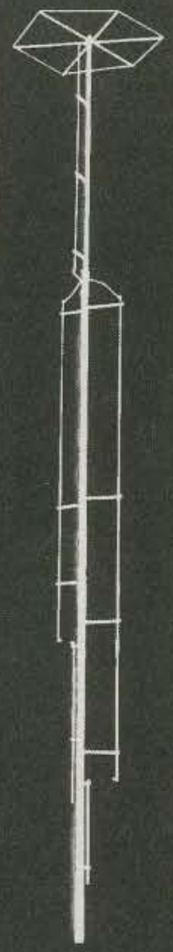


Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

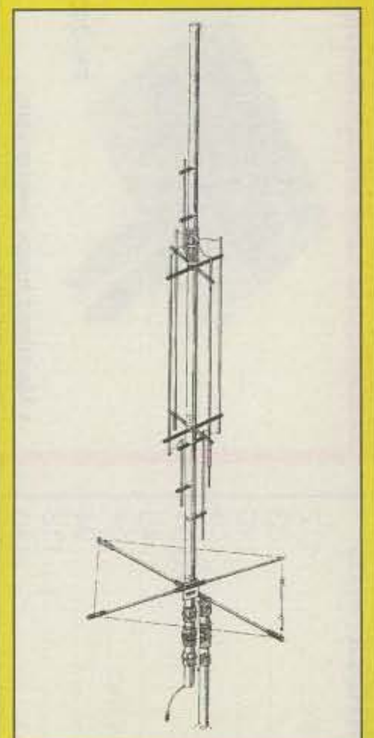
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Latest Release: **TITAN DX**



This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$259
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$299
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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"High-tech features, too, like the enhanced Smart-Search™."

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The FT-8000R is the first mobile to provide superwide receiver coverage – from 110 to 550 MHz and 750 to 1300 MHz*, receiving public safety, marine, and weather channels. Using Yaesu's exclusive Enhanced Smart Search™, the FT-8000R automatically seeks out and loads active simplex channels into up to 50 ESS memory channels in just seconds – ideal when traveling.

Built-to-last, the FT-8000R brings together the most-requested dual band features and a MIL-STD 810 rating for enduring performance. Dual receive (V+V, U+U or V+U), Crossband Repeat (bidirectional or one-way), up to 50 Watts of VHF power output (35 Watts on UHF) with High/Medium/Low selection on each band, and "plug and play" 1200 or 9600 bps packet are just a few.

Clearly a standout, the FT-8000R boasts 110 memory channels (55 per band including one-touch "Home" channels) that store repeater shift, CTCSS encode tone, and packet baud rate. Other essential features include a backlit microphone (another Yaesu first), Time-Out Timer, and an all-new S-Meter Squelch that opens based on the S-meter reading. And, for a programming alternative, the optional ADMS-2C Personal Computer Programming Kit simplifies operation even more.

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  TX: 144~148 MHz
  430~450 MHz
- 3 Power Output Levels
  2m 50/10/5 Watt
  70cm 35/10/5 Watt
- 110 Memory Channels (55 per band,including "Home" channels)
- Enhanced Smart Search™
- CTCSS Encode
- Time-Out Timer (TOT)
- S-Meter Squelch
- Dual Receive (V+V,U+U,V+U)
- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2C
- Intelligent Band Display (IBD)
- Receiver Muting
- Auto Power Off (APO)
- MIL-STD 810 Rating
- Omni-Glow™ Display
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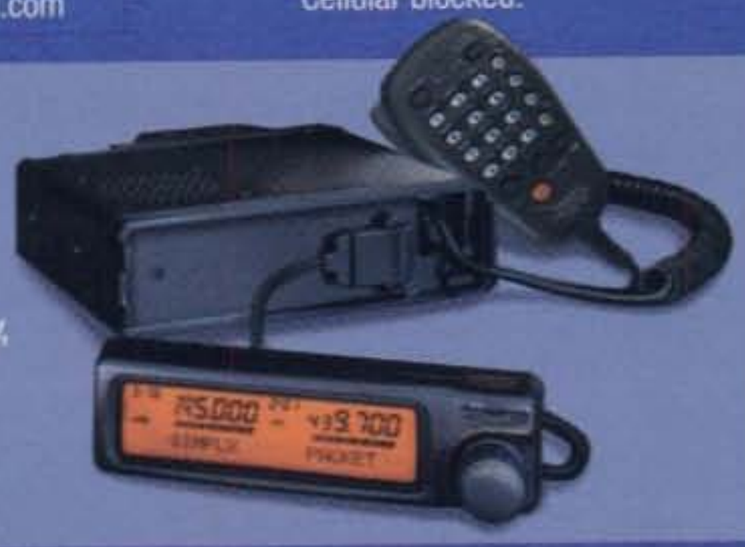

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